American Foundryman

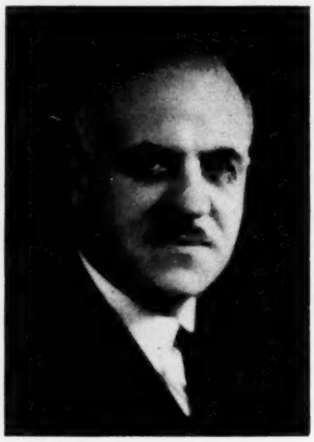
A PUBLICATION PRESENTING ASSOCIATION AND CHAPTER ACTIVITIES

Developments in Producing Steel for Castings (see p. 10). Photo courtesy Bucyrus Erie Co., South Milwaukee, Wis.

Resume of Board Meeting, See Pages 2-4—A.F.A. Committee Personnel, 1940-41, See Pages 13-19—Foundry Coke Specifications, See Pages 5-9—Methods of Producing Steel for Castings, See Pages 11-12.

September 1940

Shall We Reread an Interesting Chapter?



A CHAPTER, in a book, which stimulates our imagination and instills a desire to act on the suggestion contained therein, is certainly a chapter worth re-reading. We place a notation in the margin and refer to it again and again.

The same can be applied to any Chapter taken from the records of the A.F.A., which has a stimulating effect on its membership. Off hand, I can think of no activity as interesting and valuable as the Lecture Course that has been sponsored by the Chicago Chapter for the past four years. Therefore, if the Lecture Course has made this an interesting Chapter, let us put a notation in the margin of our A.F.A. program that it is worth repeating.

The Chicago Chapter first presented the Lecture Course in the belief that a useful service would be rendered its membership and the interest shown, through ever increasing registration and attendance during these four years, has proven, beyond doubt, that it is of great benefit to the entire membership.

Supervisors, workmen, apprentices, technical men and salesmen took advantage of the Lecture Course—total attendance of the 1940 Course, over 12 lectures, numbered 2,332, or an average of 194 per lecture. This, unquestionably has established a demand for the Lecture Course.

The aim of the lectures is to direct and stimulate thought, as well as to encourage and guide ambitious experiments towards ever greater progress—thus adding to our life and its possibilities. In these days, much of the profit and sometimes the whole of success depends upon utilizing odds and ends, commonly termed "by-products." The Lecture Course is the mill that makes use of our "by-product" of time, a few odd moments a week, where every minute is made useful in benefits derived from the amassed thought and experience of many minds.

Interesting chapters, in a book, make it valuable and assure its immortality. Continuing the simile—if the Chapters of our Association render service and hold the interest of their membership, as demonstrated in the experience of the Chicago Chapter, it may be desirable that each Chapter schedule at least a trial of one Lecture Course in an effort to make the A.F.A. of even greater service to the foundry industry.

C. E. Westover

C. E. WESTOVER, Past Chairman,
Chicago Chapter.

C. E. Westover, general superintendent, Burnside Foundry Co., Chicago, is immediate past chairman of the Chicago Chapter of the A.F.A. In his work with the chapter he has been very active in furthering the lecture courses. He was also chairman of the chapter committee which, working with the officials of the Museum of Science and Industry, developed the extensive working foundry exhibit for the Museum. A graduate of the University of Nebraska, class of 1908, he served as an apprentice in the foundry, later working with the Westover Foundry Co., W. & L. Foundry Co., Omaha Steel Works, American Manganese Steel Co., Otis Elevator Co. and Farrell-Cheek Steel Foundry Co. before taking his present position.

American Foundryman

CONTENTS

September, 1940

Volume 2 **Number 9**

Published by the American Foundrymen's Association, Inc., 222 West Adams St., Chicago, Ill., for the purpose of presenting Association and Chapter activities. Published monthly. Subscription price $1.00 per year. Single copies, 10c.

Entered as second class matter July 22, 1938, at the post office at Chicago, Illinois, under the Act of March 3, 1879.

Directors Hold Annual Meeting

THE first meeting of the 1940-1941 Board of Directors was held on the closing day of the annual convention, May 10, following adjournment of the final meeting of the 1939-1940 Board.

The newly elected President, Vice President and directors were inducted into office and the Board proceeded to organize by electing four directors to serve with the President, Vice President and Executive Vice President as members of the Executive Committee. It was then voted to defer the election of staff officers until after the close of the fiscal year when the annual reports of the officers and the auditors had been received.

The required resolutions on withdrawal of funds and resolution authorizing the President to appoint all standing and special committees were approved and on motion the meeting was then recessed to reconvene at the call of the President.

The recessed meeting was held at the Palmer House, Chicago, July 30, and while the minutes of the meeting will be published later in *Transactions*, recording proceedings for the year, some items of interest to members are reported here.

President Shannon, presiding, called for the minutes of the May 10 meeting, which were read and approved.

The report of the Executive Vice President, copies of which had been distributed to the directors, was then abstracted by Mr. Hoyt. The report, on motion, was accepted and ordered filed.

Report of Executive Committee

President Shannon, speaking for the Executive Committee, stated that at the meeting of the Board, May 10, the directors, acting upon the recommendation of Retiring President Washburn, had authorized the appointment of a committee to consider the advisability of some reorganization and additions to the staff to meet the requirements of the increasing activities of the Association, greater membership, chapter developments, additional publications, et cetera.

Continuing, he said members of the Executive Committee were appointed as members of this special committee and that, at a meeting of the committee held on the previous day, it was decided to recommend some changes in titles and responsibilities of the present staff and that further consideration be given to some additions to the staff.

Following consideration of the recommendations of the Executive Committee and the report of the Nominating Committee, the Board proceeded with the election of staff officers in accordance with Article V, Section 1, of the By-Laws.

Acting under the provisions of this Article, "that any offices may be combined at the discretion of the Board of Directors," it was voted to combine the offices of Executive Vice President, Treasurer and Manager of Exhibits and to elect C. E. Hoyt to these offices.

It was then voted to combine the offices of Secretary and Technical Secretary, reelecting R. E. Kennedy as Secretary and electing Norman F. Hindle, formerly Technical Secretary, as Assistant Secretary. The Secretary and Assistant Secretary will, in addition to performing other duties, continue the direction and supervision of technical committee activities and program development.

E. O. Jones was reelected Director of Safety and Hygiene and will, in addition to supervising the work of this section, continue with the Founders' Mutual Casualty Company, membership promotion and other activities, working with the Executive Vice President.

Jennie Reininga was reelected Assistant Treasurer and as office manager will have charge of the Association and chapter membership records.

The question of additional staff assistants will be considered at the fall meeting of the Executive Committee.

Reports of Finance Committee

The report of the 1939-1940 Finance Committee was presented by its chairman, H. Bornstein. Reviewing the report of the auditor, which will be published in *Transactions*, he said: "Your committee feels that the reserves and surplus shown are not sufficient and that efforts should be made to increase these funds at a more rapid rate. At the present time it appears that substantial increases in membership, particularly Sustaining membership, offer the best opportunity. We therefore urge that the work on membership be continued actively." The report, on motion, was accepted and ordered filed.

The report of the 1940-41 Finance Committee was presented by its chairman, H. S. Washburn, submitting a budget of income and expenses and the committee's recommendations for salaries and compensations. Following discussion and explanation of the budget by Chairman Washburn and the committee's recommendations covering salaries, the report of the Finance Committee was approved.

Board Committee on Technical Activities

The Board, acting upon recommendations submitted in the report of Secretary Kennedy, approved the appointment of a Board committee to coordinate and control the work of the Divisions and general interest technical committees, controlling publications and publication policies and reviewing and recommending research projects and appropriations. On this committee, which will be known as the Technical Activities Correlation Committee, President Shannon appointed, as representing the Board, Director Bornstein as chairman and Directors Walls and Culling.

Special Action

The Finance Committee's recommendation to publish, during the year, a combined index of *Transactions* for the years 1930-1940 inclusive, was approved, and a further recommendation that a year book be published, was referred to the Executive Committee for further consideration with power to act.

The recommendations to the Board of Awards that money be appropriated from the Awards fund for continuing during 1941 the patternmaking and molding apprentice contests was approved.

Chapter Membership Contest

A report on results of the membership drive in chapter territories was presented, showing that the Birmingham District Chapter headed the list with 53 members added, an increase of 33.5 per cent, and they were declared winners of the contest. Northeastern Ohio, Quad City and Wisconsin Chapters were second, third and fourth respectively, with increases of 12.80, 12.62 and 12.58 per cent.

Annual Business Meeting

It was the unanimous recommendation of the directors that the program of the 1941 annual business meeting be similar to the program of the 1940 meeting, including presentation of medal awards and the Annual Awards Lecture.

1941 Convention

The committee on convention location, appointed by the President at the May 10 Board meeting, submitted a progress report stating changes in the status of some invitations since presented as affected by world conditions. The committee was granted further time and instructed to make its report to the Executive Committee at the fall meeting, which will submit their recommendations to the Board of Directors for approval by letter ballot.

Chapter Officers' Conference

It was voted to hold the 1941 chapter delegate conference during the 1941 convention. It was further recommended that provision be made for a general meeting of chapter officers, preferably at luncheon or dinner during the convention, for the purpose of promoting acquaintanceship.

Reports of Officers

The annual reports of the Secretary, Technical Secretary, Treasurer and Director of Safety and Hygiene, copies of which had been mailed to directors in advance of the meeting, were submitted in abstract by Messrs. Kennedy, Hindle and Jones and, following discussion, were, on motion, accepted and ordered filed.

Summary of Officers' Report

Report of Executive Vice President

Executive Vice President Hoyt, summarizing the report on membership, said paid-up membership in all classes June 30, 1939, numbered 3,025; that during the year 635 new members were added; that losses by resignation, death or delinquency numbered 272, leaving a total paid-up membership as of June 30, 1940, of 3,388, a net gain of 363, a record high in both total membership and number of new members for any one year. The report showed that 29 companies had supported the Association during the year through Sustaining membership with dues ranging from $50 to $125 and that during the membership drive and prior to June 30, forty companies had elected to change their classification to Sustaining membership, making a total of 69 Sustaining members as of July 1.

Credit should be given, he said, to all those who responded to the call and served as members of the special membership committee during the convention under the leadership of Past President James L. Wick, Jr., and to the membership committees of all chapters, for good work done.

Chapter Refunds. Mr. Hoyt, commenting on the financial statements presented, pointed out that when the By-Laws were revised establishing new classes of membership and rates of dues, provision was also made for increasing the pro rata refund to chapters from 15 to 20 per cent and that the total chapter refunds for the past year were $8,567.61, as against $5,064.36 the preceding year. "The cost of chapter activities we believe to be one of the most justifiable expenses we have. Chapters are now carrying on the work of furthering Association objectives in 18 industrial centers, helping to make the Casting Industry more articulate in their respective communities. What they are doing, and are organized to do, entitles them not only to the support of the National Association but of all operators of foundries in their respective territories."

Casting Exhibit at Chicago Convention. In commenting on the castings exhibit staged at the Chicago convention, Mr. Hoyt said credit should be given to Mr. Jones and all who co-operated with him in planning this display and supplying material.

Report of Secretary

Secretary Kennedy, reporting on general Association technical and chapter activities, paid tribute to the excellent work and active participation of the increasingly large number of members who are giving their time and experience in promoting Association objectives. Nearly 500 members are serving on national committees or as chapter officers and directors. In addition, a large number are serving on chapter committees. Their combined efforts constitute a force which is making the Association an instrument for keeping the industry to the forefront.

In discussing committee activities for the past year, Mr. Kennedy commented on the excellent work done by committees on Apprentice Training, Inter-

national Relations, Foundry Refractories, Plant Equipment, Foreman Training, Foundry Costs, Job Evaluation and Time Study, committees of a general nature not covered by any particular division.

Continuing his report, the Secretary commented on the annual meeting program which he said was designed to supply material of value to all types of members, namely, the research, shop operating, engineering and management groups. Thirty-six sessions in all were held, exclusive of the entertainment and plant visitation features. Development of lecture courses at annual conventions is now an accomplished fact, according to the report, since a lecture course committee has now been appointed to determine the policies to be followed and subjects to be discussed in such courses at future conventions.

Chapter Activities. Referring to chapters, Secretary Kennedy reported that one new chapter, Central Indiana, had been established during the past year, making a total of 18 chapters holding regular monthly meetings. The estimated attendance at such meetings during the past year was approximately 18,000. "Chapters engage in various activities other than regular meetings, including educational courses, regional and extension meetings. The Detroit and Chicago Chapters sponsor educational courses, while Southern California has co-operated with vocational schools in sponsoring evening courses. Nine regional meetings were held during the year at Birmingham, Chicago, St. Louis, Moline, Baltimore, Milwaukee, East Lansing, Mich.; New Brunswick, N. J., and Cambridge, Mass. One of the outstanding chapter activities was the dedication of the working foundry exhibit at the Museum of Science and Industry in Chicago, an undertaking sponsored by the Chicago Chapter."

Division Activities. The divisional activity of special interest was the formation of a Patternmaking Division. The advisory committee of this division has been appointed, and other committees are in the process of formation.

After reporting on the work of the steel, malleable and gray iron divisions, Mr. Kennedy called special attention to recommendations of the Committee on Co-operation with Engineering Schools that this committee be disbanded in favor of one general research committee through which all contacts with engineering schools and research organizations would be made, having under its direction subcommittees for gray iron, steel, malleable, non-ferrous, sand, cupola, etc. This recommendation was made with a view toward consolidating research activities of the Association under one committee.

Mr. Kennedy stated that the committee on Cupola Research deserved special mention. Organized during the past year, it has before it a most important project, that of attempting to evaluate what is known about cupola operation at present and then directing research to present data on phases unknown or uncertain.

Report of Technical Secretary

The report of Technical Secretary Hindle dealt in general with publications issued by the Association during the past year. He explained the purposes and distribution policies of each, namely, *Cast Metals Handbook*, preprints, quarterly *Transactions, American Foundryman* and *The Follow-Up*.

He also reported on the progress which has been made by the Non-Ferrous Division during the past year and upon the work being prosecuted by the Foundry Sand Research Research Committees.

Continuing, he said that while all subcommittees of the Foundry Sand Research Committee have been especially active during the past year, the work of the subcommittee on Physical Properties of Foundry Sands at Elevated Temperatures deserved special mention. Under the direction of this subcommittee, work on the development of technique and apparatus, together with the testing of actual foundry sand mixtures has progressed during the year. "The subcommittee has worked out a definite program for future work which will result in much valuable information not only on the high temperature properties of foundry sands and the effect of different variables, but also will correlate this material with the room temperature properties of the same sands."

Report of Director of Safety and Hygiene

Mr. Jones, Director of Safety and Hygiene, reported that the Industrial Hygiene Codes Committee had completed two codes during the past year, namely, "Code of Recommended Good Practices for Metal Cleaning Sanitation" and "Recommended Good Safety Practices for the Protection of Workers in Foundries," making a total of five codes completed and available to the industry.

J. R. Allan, chairman of our committee, served as a member of the New York State Advisory Committee, which completed during the year a revision of the New York Industrial Code Bulletin No. 10, "Equipment, Maintenance and Sanitation of Foundries and the Control of Dust, Gases and Fumes in Foundries."

Reporting on the status of the Founders Mutual Casualty Company, successor to the American Founders Compensation Group which was formed in 1936, Mr. Jones said, "The operation of this company as it has been sponsored by the American Foundrymen's Association has proved many of the contentions that had been made with regard to excessive rates charged for workmen's compensation and occupational disease insurance coverage.

"Information received indicates the existence of this company has been responsible for general reductions in insurance rates throughout the country and in response to requests of foundrymen applications have been made to operate in other states."

Foundry Coke Specifications

By B. P. Mulcahy*, Indianapolis, Ind.

This paper was presented before one of the Gray Iron sessions of the 1940 Annual Convention at Chicago. It is reprinted here as it is felt that all foundrymen using coke should be given an opportunity to express their preferences as to items which should be included in foundry coke specifications. It has been found that the coke producers, who are cooperating in developing these specifications, are very willing to be guided by the advice they can receive from foundrymen. Any discussion on this report should be sent to Mr. Mulcahy, with copy being forwarded to Dr. J. T. MacKenzie, American Cast Iron Pipe Co., Birmingham, Ala., who represents the A.F.A. Gray Iron Division on the A.S.T.M. Committee D-5 on Coal and Coke.

AT the present time there is an active subcommittee of the American Society for Testing Materials engaged in the problem of defining and suggesting specifications for foundry coke. This committee (ASTM D-5-Sub-committee VIII) recognizing the scope and divergent opinions on this subject, has suggested a discussion among the foundrymen, and your A.F.A. Program Committee has kindly provided for this presentation.

The purpose of establishing specifications on commodities which are commercially produced and sold should be to assist the purchaser in the selection of the materials offered for sale and to aid the producer in maintaining or raising the quality of the material he produces. With the technical advance registered in industry, on the whole within the last twenty years, any commodity which has not been clearly defined as to the limits of its desirable and undesirable characteristics must naturally fall by the wayside or at best remain stationary in its progress or betterment.

Because of the diversity of demands and geographic locations of the consumer and the highly technical problems of the producer, foundry coke for years has occupied a difficult position to define, yet such a definition must be undertaken if the related industries are to keep in step with the progress evidenced by their allied fields.

Four Types of Foundry Coke

Foundry coke, as the term is used, refers to coke used in a cupola for the purpose of melting iron and will include *by-product* coke from coal, *beehive* coke from coal, *pitch* coke from coal tar distillates, and *petroleum* coke from petroleum distillates.

The wide divergence in chemical and physical characteristics of these cokes immediately precludes the possibility of establishing one set of specifications to govern the limitations of all of these cokes. Since, however, the largest tonnage of coke used for this purpose is that produced from coal in by-product ovens, it seems desirable as a start to at least attempt a definition of the properties of this material, and the suggestions contained in this report will refer only to this commodity.

*Research Engineer, Citizen's Gas and Coke Utilities.

The present A.S.T.M. specifications D 17-16 are too limited to materially assist either the consumer or the producer in his requirements for this product. This statement is substantiated by the fact that we, as a producer, have never referred to these standards as the index of character desired, nor have had these standards referred to us by a consumer.

The answer to this is found in a study of the specifications themselves.

First: They refer only to the chemical characteristics as defined by the tests themselves. The limits of some of these factors need revision.

Second: They neglect entirely the physical characteristics of the coke which invariably the consumer appraises to the almost complete exclusion of the chemical characteristics.

It is also true that the producer's interest in the product must of necessity be wider in scope than that of the consumer and to this end some suggestions are contained in this report which, although outside the province of specifications, are directly related to the subject. These suggestions are made with the thought in mind of revision, inclusion or formulating tests which are of importance in this regard.

Below are listed the factors which it is believed should be considered in the establishment of these specifications:

Tests	*Consumer*	*Producer*
1. Sampling	Yes	Yes
2. Chemical Analysis		
a. Moisture		Yes
b. Volatile matter	Yes	Yes
c. Ash	Yes	Yes
(1) Fusion point of ash		Yes
(2) Analysis		Yes
d. Sulphur	Yes	Yes
3. Physical Properties		
a. Size	Yes	Yes
b. Shatter	Yes	Yes
c. Tumbler	Yes	Yes
d. Combustibility	Yes	Yes
e. Wt./Cu. Ft.		
(1) Struck measure		Yes
(2) Actual		Yes
f. Porosity		Yes
g. Specific gravity		Yes

Discussion

1. Sampling:

As defined in D 17-16, the method suggested pertains only to a sample to be used for chemical

analysis quoting "by knocking off with a hammer a piece approximately the size of a walnut." It is quite evident that many of the physical factors cannot be determined on such a sample.

Suggestions:

The producer can, of course, select his sample by taking portions of the coke periodically from the full width of the belt as a car is being loaded, or from the wharf. The representative sample of the coke as loaded or produced would serve for screen tests, and chemical analysis, and if a sufficiently large sample is taken, a selected sample of full length pieces could be used for the shatter test.

The consumer, however, would have difficulty in obtaining a representative sample for a screen test unless this were taken as the car was being unloaded. If he did not want to run the screen test, full length pieces could be taken from the top of the car at stated points. This sample could serve for the shatter test and chemical analysis.

It is important that with the exception of the screen test, the sample should be selected with full length pieces only so that the sample shall be a weighted average of the coke quality both as to structure and composition. Samples taken otherwise do not represent a fair average of the coke in these respects.

The methods and quantities in A.S.T.M. standards D 346-35 are satisfactory for this purpose.

2. Chemical Analysis

A. Components: The A.S.T.M. methods of test of the components listed are satisfactory as now employed. The present specifications (D-17-16), however, should be revised. These are now as follows:

	Per Cent
Volatile Matter	Not over 2.0
Fixed Carbon	Not under 86.0
Ash	Not over 12.0
Sulphur	Not over 1.0

and the following specifications are suggested:

	Per Cent.
Volatile Matter	Not over 1.0
Ash	Not over 10.0
Sulphur	Not over 0.8

A volatile content higher than 1.0 per cent is both unnecessary and detrimental to the character of the coke, and this limitation is well within the province of the careful operator.

A 10 per cent limit on the ash should allow a very wide selection of coals and a higher limit penalizes the consumer on the heating value.

A sulphur content of 0.8 per cent should also permit a wide latitude in the selection of the coals used and an excess of the limit suggested only imposes an additional burden on the foundry operator to prevent absorption of this material by the iron.

B. Combustibility: It is felt that this factor is very important in an appraisal of any coke, but the present tests for this factor need considerable clarification before any method of test or specifications can be suggested.

3. Physical Properties

A. Size: Since the introduction of the use of more than one size of foundry coke, the situation with respect to this factor has become somewhat difficult to define. However, the following suggestions are offered for discussion.

Until the last few years foundry coke as shipped was generally loaded over 3½ in. or 4 in. grizzly screen, and the maximum size of the coke was largely determined by the width of the oven and other operating details.

On coke of this character and size the principal undesirable feature is one of excessive breakage, such breakage as might be defined by limiting the per cent of the coke which should pass through a 2 in. square opening screen—say, for instance, 20 per cent, or another possibility, which would apply to sized coke would be to specify that the car as received should conform to the following limitations.

Oversize—shall not contain more than 20 per cent of material of a size in excess of the maximum screen size.

Undersize—shall not contain more than 20 per cent of material of a size less than the minimum screen size.

In other words, a 4 in. x 6 in. coke would not contain more than 20 per cent of a size in excess of 6 in. or more than 20 per cent of a size smaller than 4 in. Screens employed would be the rigid square opening type and the A.S.T.M. D 293-29 test employed by both producer and consumer.

B. Shatter Test: For this test, the following modification of D 141-23 is suggested. The test should be conducted as outlined in the standard test, but reported as follows:

Wt. of Sample	——— lbs.
Number of Pieces	———
Avg. Wt. per Piece	——— lbs.
Per cent on 2-in. Screen	———
Per cent on 3-in. Screen	———
Per cent on 4-in. Screen	———
Wt. of Pieces on 3-in. Screen	——— lbs.
No. of Pieces on 3-in Screen	———
Avg. Wt. per Piece on 3-in. Screen	——— lbs.
Wt. of Pieces on 4-in. Screen	——— lbs.
No. of Pieces on 4-in. Screen	———
Avg. Wt. per Piece on 4-in. Screen	——— lbs.

For the purpose of specifications the factors suggested are:

Per cent on	*Per cent*
2-in. Screen	Not less than 80
3-in. Screen	Not less than 65
4-in. Screen	Not less than 40

The 2 in. and 3 in. per cents are cumulative.

The present method of reporting the factors from the shatter test refers to sizes which constitute a very small percentage of the usual foundry coke, and as now designed uses the screen size of 2 in., 1½ in., 1 in. and ½ in. In our own particular instance the per cent through a 2 in. screen will not exceed 10 per cent, which represents a very poor index to judge its character.

C. Tumbler Test: As contrasted with the shatter test, which largely shows the effect or extent of fissuring occurring in the coke, the tumbler

test principally shows the resistance that a coke has to abradability. Or in other words, this test reflects a coke's hardness or softness as measured by the abrasion of coke surfaces.

The present test D 294-29 evidently was designed to measure this feature of a coke much smaller in size than normally characterizes foundry coke.

Section 4 of this standard test specifies that "the coke shall be sized by sieving on a 3 in. and on a 2 in. square mesh screen without crushing the larger pieces."

As referred to earlier, the objection to this process is that a weighted average sample of foundry coke cannot thus be obtained.

Employing this standard method of test on our coke for instance, has shown that with a 25 per cent variation in the 4 in. shatter test index, the hardness or stability factor only shows a 5 per cent variation and the difference between the hardness and stability factors is less than 1 per cent.

It is felt that this test has some merit in appraising coke structure, but that modification of this test will be necessary when applied to foundry coke.

Data is now being collected on this test under modified conditions so that at the present time no specifications are suggested.

D., E., & F.—Wt. Per Cu. Ft., Porosity, Specific Gravity.

It is felt that at the present time these factors are of interest to the producer only in their relation to the coke structure and until the influence of these factors is more definitely established, it would be well to not to suggest any specifications.

Suggested Specifications

1. *Sampling*

A. For Screen Test
D 293-29
B. For Shatter Test
D 346-35 or D 293-29

In each instance full length pieces only to be selected.

2. *Chemical Analysis*

A. Volatile Matter, Ash, Sulphur } D 271-33

Specifications	*Per Cent*
Volatile Matter	Not over 1.00
Ash	Not over 10.00
Sulphur	Not over 0.80

3. *Physical Properties*

B. Combustibility
No specifications suggested

A. Size
a. Coke as loaded over 3½-in. or 4-in. screen shall not contain, when received, more than 20 per cent through a 2-in. square opening screen.
b. Sized coke
Oversize: shall not contain, when received, more than 20 per cent of material in excess of maximum screen size.
Undersize: shall not contain, when received, more than 20 per cent of material of a size less than the minimum screen size.
Note: All screen sizes referred to shall be square opening screens.

B. Shatter Test

	PerCent
Per cent on 2-in. screen	Not less than 80
Per cent on 3-in. screen	Not less than 65
Per cent on 4-in. screen	Not less than 40

C. Tumbler Test
No suggested specifications

Information Wanted From Foundry Users

In order to assist the committee in their work of preparing foundry coke specifications, foundry users are invited to submit their suggestions particularly as to the questions listed below.

1. *Sampling*

As a consumer do you have any suggestions relative to sampling?

2. *Chemical Analysis*

What limits do you propose for the following constituents:

Volatile Matter———Ash———Fixed Carbon ———Sulphur———

Would you be interested in a test for combustibility? Why?

3. *Physical Properties*

Size—What suggestions do you have with respect to coke size?

Shatter Test—What limits do you suggest for the shatter test?

Tumbler Test—The tumbler test measures the abradability of coke.

Are you interested in this feature? Why?

4. Please list below any other factors or features of coke you think should be considered for specifications, and give your reasons.

Discussion of Paper

Presiding: S. C. Massari, Association of Manufacturers of Chilled Car Wheels, Chicago, Ill.

Dr. Jas. T. MacKenzie[1] *(written discussion):* The idea of having this meeting is to consider foundry coke developed from the conflict of ideas which exists in the A.S.T.M. Subcommittee on Foundry Coke. These ideas arise from different conceptions of the purpose of the specifications. Mr. Mulcahy, as he has already stated, believes that a specification should be a guide to the purchaser, and that the A.S.T.M. Specification for Foundry Coke should tell the purchaser what kind of coke he ought to have. In this classification comes steel for boiler plate, for stay bolts, and so forth; and specifications for cast iron pipe which specify minimum values, dimensional tolerances, and so forth.

The other idea is that a specification should be a basis for adjustment between buyer and seller on the principle that the buyer knows what he wants and specifies it: that there is an agreed set of tolerances permitted which can be stated in the specification and used in case of dispute. A specification of this kind is the specification for pig iron where the foundryman knows what silicon he wants in the pig iron, how much sulphur he can tolerate, how much manganese and phosphorus. He knows, for instance, that if he orders 2.00% silicon pig iron, he is going to get between 1.875 and 2.125. Any variation outside of those limits is proper cause for rejection or adjustment of price. Mr. Mulcahy suggests the first type of speci-

[1]Metallurgist, American Cast Iron Pipe Co., Birmingham, Ala., and A.F.A. representative in A.S.T.M. Committee D-5 on Coal and Coke.

fication for foundry coke; I am in favor of the second type. Our proposed specification would read as follows:

Chemical Properties and Tests

B. Paragraph 9: The purchaser shall specify desired values for all or part of the chemical tests, except moisture, enumerated in the preceding paragraph. The dry coke shall not vary in composition from the specified values by more than the following tolerances:

Volatile matter—10 per cent of specified value plus 0.10 per cent volatile
Ash—5 per cent of specified value plus 0.25 per cent ash
Sulphur—10 per cent of specified value plus 0.05 per cent sulphur

Physical Properties and Tests

C.—Shatter Test

10. Sampling and procedure shall be as described in the standard method of Shatter Test for Coke (A.S.T.M. Designation D 141).

11. The shatter indices obtained from this test shall not vary from the values specified by more than 5 per cent of the specified values.

D.—Cell Space

12. Sampling and procedure shall be as described in the standard method of Test for Cell Space (A.S.T.M. Designation D 167).

13. The cell space obtained from this test shall not vary from the value specified by more than 5 per cent of the specified value.

E.—Size

The size of the coke shall be determined by screen analysis of a sample taken from the loading belt at the oven. This sample shall consist of one approximately fifty pound sample (using the entire cross section of the belt for a sufficient period of time to get this amount) for each 5 tons loaded into the car. Large shipments such as by barge and boat may be sampled otherwise by agreement.

Screens used shall be rectangular with 4 in., 3 in., 2 in. and 1 in. openings or other sizes as agreed on. Specifications shall state per cent allowable on each or all of these screens and a tolerance of 5 per cent on each figure specified will be allowed.

As this specification stands, it would allow either the petroleum cokes or pitch cokes, or the high ash cokes which are used to some extent. I do not intend to hold any particular brief for the inclusion of pitch and petroleum nor would I delay the specification one minute on their account. This specification would be applicable to all kinds. There is certainly one well known and valuable coke produced with over 10 per cent ash. This coke is the coke used at Saginaw Malleable for the very specific purpose of obtaining low carbon, and we use it at our plant for the same reason. We feel, therefore, that there should be a low limit set to a specification for ash just as there should be an upper limit, and since the main thing a foundryman is concerned with is uniformity, a variation in one direction is as bad as the other. It is, of course, feasible to set two or three grades of coke into the same form of specification, Mr. Mulcahy suggests, and this might be the simple way out.

Shatter Tests

We were very much pleased with Mr. Mulcahy's modification of the shatter test and have used it at our plant for some time. I think probably in some of the weaker cokes that the continuance of the 1½ in. screen and probably also the 1 in. would be of value. The matter of size is largely a question of agreeing on the point of sample, and we think it should be sampled at the loading dock of the coke oven, but if there is a case of dispute, a full face of the coke in the car from top to bottom should be taken. A five-ton sample would be small in my opinion to base a complaint on when sampling an ordinary railway car.

We cannot agree with Mr. Mulcahy on the unimportance to the user of porosity. I think this property should be retained in any specification.

I trust that the meeting will not take up any time discussing this or that value in either specification as this will have to be worked out with producers and consumers in the several districts. The principle of the specification is the thing that the committee wishes very much to have discussed. If it is decided to confine the specification to coke from coal, then it would not appear necessary to keep the tolerance form for volatile and sulphur, for instance; so that a third alternative might be to grade coke according to ash, say, below seven, seven to nine, and above nine per cent, or some such division. Here, however, the tolerances on shatter, cell space, and size would be the most convenient way of settling that problem, as it would be, I think, too complicated to have sub-divisions in each ash group to take care of differences in shatter index, cell space, and size. Size is going to be a matter of specification anyhow. In fact, it has already become a matter of specification.

As chairman of the subcommittee, I sincerely trust that the discussion will bring out the wishes of the foundrymen.

R. A. Sherman[2] *(written discussion)*: Accepting the statement of the author that the present A.S.T.M Specifications for Foundry Coke are not now used by either the producer or consumer, the writer agrees that a revision of these specifications is in order. Specifications are tools and like tools are only of value when used; if they become obsolete, they should be revamped or replaced by the latest development.

Specifications may not be used either because they are so rigid that they cannot be met or so loose as to include anyone's product. A mid-ground must be chosen that will exclude definitely undesirable products and by frequent revision gradually raise the level of quality of the manufactured product.

This tightening up on specifications is in the author's mind when he suggests the change from 2 to 1 per cent, in volatile content, from 12 to 10 per cent in ash, and from 1 to 0.8 per cent in sulphur. Considering the ash content for the moment, the writer questions the desirability of inclusion of a limitation on ash content. Although he agrees with the desirability of a low ash content and with the aim to spur the producer to decrease it, it is probable that coke of higher than 10 per cent and even than 12 per cent will continue to be freely offered by the producer, and accepted by the user when the price is such as to offset the lower value and higher costs incident to the high ash. The writer would favor a specification for tolerance in ash content rather than definite limitation.

A similar argument might be made on the subject of sulphur content, but because the sulphur so closely offsets quality of the product as well as cost, the writer is inclined to agree with the author on the desirability of increasing the rigidity of the specification.

Size Specification

The item of size certainly should be included in a specification not as a limitation on the definite size, but as a tolerance. The writer's suggested tolerance of 20 per cent on both top and bottom size seems unduly lax. The A.S.T.M. Specification on the size of coal allows 5 per cent oversize and 15 per cent undersize. Is it not possible for a producer of coke to meet a specification at least that rigid?

[2]Supervisor, Fuels Division, Battelle Memorial Institute, Columbus, Ohio.

A revision in methods of sampling for the size and shatter test are certainly in order as well as in the method for the shatter test itself along the lines suggested by the author.

The "combustibility" of coke, by which is meant, for the present purpose, its burning characteristics, is undoubtedly the most important item of coke quality for it governs the rate of burning with a given rate of blast, the temperature produced, the distribution of the temperature in the bed, the composition of the gases in contact with the metal, and the amount of sensible and undeveloped heat lost in the waste gases. Many papers have been written on the subject and many tests have been developed, but complete correlation with cupola practice has not been obtained. This is largely owing to the fact that we know so little by actual data of what occurs within the cupola.

If we had a combustibility test of which we knew the significance, we could undoubtedly dispense with other items such as volatile content, porosity, and cell structure. But combustibility tests or ignition temperature determinations can not well be correlated with overall results on the cupola. We need first to use a cupola as a combustibility furnace. By probing into the cupola to determine the rate of progress of combustion through the measurement of the temperature and composition of the gases, we can determine how these and the rate of melting and quality of the iron are affected by various measurable characteristics of coke. Then, and only then, will we be equipped to develop a laboratory test for combustibility that has significance.

B. P. Mulcahy *(written response to R. A. Sherman):* In considering these proposed specifications, it is wished to point out that for the first time physical characteristics are proposed for consideration, and the specifications suggested for these physical characteristics are not thought to be the final word on the subject, so that it is perfectly possible that the 20 per cent tolerances on top and bottom sizes may not be stringent enough. However, if the size specifications as proposed are accepted the general consensus of opinion of producers and consumers will ultimately arrive at the fair tolerance necessary.

The writer is in complete accord with Mr. Sherman's remarks concerning combustibility of coke and recognizes that this is a very important phase of the problem (but also one which has proven very elusive in the matter of determination and definition), and is quite sympathetic to the thought of eventually including this property in any specifications.

B. P. Mulcahy *(written response to Dr. J. T. MacKenzie):* As stated in our preliminary discussion on these foundry coke specifications, we mentioned that because of the wide divergence in chemical and physical characteristics of by-product and bee-hive cokes from coal, and petroleum coke and pitch coke, it was deemed inadvisable to propose one set of specifications for all these different cokes, and further, since by-product coke was used for cupola melting to a much greater extent than any of the other cokes, the specifications were therefore confined to this material. In support of this may I quote the last available figures on the production of the various cokes (taken from U. S. Bureau of Mines Mineral Yearbook 1939):

By-product for foundry use—1939	1,483,000
Bee-hive for foundry use—1939	199,000
Petroleum (all uses)—1938	1,602,000
Pitch (all uses)—1937	181,000

The figures for the by-product and bee-hive cokes as noted were used entirely for foundry purposes. The petroleum and pitch cokes represent total production and the most of which was used for domestic or industrial heating with a very limited tonnage diverted for recarburizing.

Since our problem is one of definition of the requirements of a coke for melting iron in the cupola, it seems advisable to confine our demands of coke characteristics to those which we know or feel are relative to the process of cupola melting, and for the moment at least our attempt to define these characteristics should be limited to this concept.

Mr. MacKenzie's proposal of suggesting a set of tolerances based on the premise that the purchaser has full knowledge of the material which he is specifying does not seem to fit the case as it actually exists, for the principal reason that many of the individual factors considered have not been definitely assigned their value in the melting process, and therefore would make it very difficult for the consumer to know exactly what he wanted or rather what he needed in the matter of individual factors. Our proposed set of specifications, we believe, takes cognizance of the major isolated points which we feel can be assigned a value in the matter of cupola melting, and we have therefore suggested the limits shown.

Our feeling also is that the use of petroleum or pitch coke in the melting process is not for the same purpose that the by-product or bee-hive coke is used. It is used specifically in most instances in the cupola for the purpose of recarburizing, and therefore its demands and its native characteristics are bound to be entirely different from those of the by-product or the bee-hive coke. Hence, if specifications for this material are needed, they should be considered separate and apart from the by-product and bee-hive cokes.

It is entirely possible that tolerances can be applied to the general specifications proposed, which was indeed in mind in the sugestions for size specifications, and tolerances also could be applied to the suggested specifications for the shatter test. The main thing which the writer wishes to develop is that it does not seem equitable to include in the same specifications a by-product coke with less than 1 per cent volatile content, and a pitch or petroleum coke which might have 5 per cent to 8 per cent volatile content, for the principal reason that this much residual volatile matter in a by-product coke would render it unfit for cupola practices.

Apprentice and Foreman Training

EACH year, after the annual convention, the Association has published an important and valuable pamphlet containing the papers that were presented on the subject of apprentice and foreman training. As is shown, every year, by the increasing amount of attendance and discussions at these sessions, this subject is becoming more and more important. This year the Association, in accordance with its policy, has printed this pamphlet. This booklet contains the discussions of papers written by A. L. Armantrout, C. W. Wade and A. H. Wornom; and included with these papers is a panel discussion of the foreman training session. These articles make worthy reading for men interested, and who wish to stimulate apprentice training in their plants.

Investigate High Temperature Properties of Foundry Sands

FOR the past several years, Foundry Sand Research Committee Subcommittee 6b7 on Physical Properties of Foundry Sands at Elevated Temperatures has been investigating this subject and has published a progress report on the work thus far accomplished. The title of the report* is "Report of Progress of Sand Research on Steel Sand Mixtures at Elevated Temperatures." The author is H. L. York, who was employed by the Association as research fellow during that section of the investigation. Mr. York left the employ of the Association and John R. Young has been appointed in his place.

Work done by the subcommittee has consisted of tests at high temperatures on certain definite mixtures specified by the subcommittee. These tests have shown:

1. That equipment has been developed for the testing of high temperature properties of foundry sands.
2. That a technique has been developed by which results can be checked and duplicated.
3. That when sand mixtures are slowly heated to progressively higher temperatures, their crushing strength increases up to a certain point, after which it decreases.
4. That maximum strength varies somewhat with the mixtures tested.
5. That certain mixtures can be heated very rapidly without the test pieces breaking but others cannot stand this shock test.
6. That sand mixtures expand a variable amount when heated.

The tests thus far conducted have involved several variables whose effects are not definitely known. For example, in testing sand mixtures at high temperatures, the questions might be asked, "What is the effect of grain size and distribution? Of amount and kind of bond? Of amount of moisture? Of mulling time? Of character of ramming?"

To answer these and other questions and to determine the effect of different variables, this subcommittee has authorized a research program which involves both basic and practical research. The first work to be done will be a comparison of the test results obtained on various sized specimens used in high temperature work. This work was made necessary by the fact that two specimens have been used. One is $1\frac{1}{8}$ x 2 in. and the other, 2 x 2-in. The former specimen is double-end rammed and the other single-end rammed. If it is possible to determine conversion factors for properties determined on the different sized specimens, a comparison of sand properties determined by either method will be possible.

The next step in the program will be the determination of the effect of different variables in sand mixtures, using as the basis practical sand mixtures used in the steel foundry. Such variables as grain size and distribution, moisture, mulling time, bonding clays and cereal binders, will be studied. On these mixtures, not only will the high temperature properties of such sand mixtures be studied, but also the room temperature properties. Thus, room temperature properties will be correlated with high temperature properties, if such a correlation exists.

Members of the subcommittee directing this work are as follows:

Chairman—D. L. Parker, General Electric Co., Everett, Mass.

C. W. Briggs, Steel Founders' Society of America, Cleveland.

A. C. Davis, Cornell University, Ithaca, N. Y.

H. W. Dietert, Harry W. Dietert Co., Detroit.

Werner Finster, Reading Steel Casting Co., Reading, Pa.

R. A. Gezelius, General Steel Casting Corp., Eddystone, Pa.

W. C. Hamilton, American Steel Foundries, East Chicago, Ind.

Howard Mason, Gould-Symington Corp., Depew, N. Y.

C. P. Randall, Hunt-Spiller Mfg. Corp., Boston, Mass.

W. G. Reichert, American Brake Shoe & Foundry Co., Mahwah, N. J.

D. C. Zuege, Sivyer Steel Casting Co., Milwaukee, Wis.

Tests thus far conducted have been on steel foundry sands because it was thought that since those sands must stand more abuse due to high pouring temperatures, etc., than sands used in other divisions of the industry, that data and information obtained on such sands would be applicable to sands used in the manufacture of gray iron, malleable and non-ferrous castings.

**Transactions*, American Foundrymen's Association, vol. 47, pp. 807-830.

Young Appointed Research Fellow

JOHN ROBERT YOUNG was recently selected research fellow to carry on the sand research investigation work for the Association at Cornell University, Ithaca, N. Y., in place of H. L. York, resigned.

Mr. Young was born in Squantum, Mass. He attended the public schools in Quincy, Mass., and in 1933 was graduated from the Quincy High school. A year's post graduate work was taken at North Quincy High school before he entered Northeastern University in 1935. He was graduated from that university in 1939 with a degree in chemical engineering.

From 1935 to 1939 Mr. Young was employed at Hunt-Spiller Manufacturing Corp., South Boston, on the cooperative plan.

Report of Committee on Methods of Producing Steel for Castings

Under the steel division of the Association, a major activity has been that of having committees survey and report on developments during the year of such phases of steel production as melting methods, heat treatment, radiography and testing. Of these committees that on "Methods of Producing Steel or Castings" is composed of the following: C. E. Sims, chairman, Battelle Memorial Institute, Columbus, Ohio; Ernest Lancashire and F. A. Melmoth, Detroit Steel Castings Co., Detroit, Mich.; H. D. Phillips, Lebanon Steel Foundry, Lebanon, Pa., and W. J. Phillips, Malleable Iron Fittings Co., Branford, Conn. The report of this committee which appears here was presented before the steel division session at the Chicago Convention.

YOUR committee's study of developments in the production of steel for castings during the past year has revealed no revolutionary innovations but has shown considerable interest in the further development of new methods and the revival, under new conditions, for methods temporarily in disfavor.

Cupola-Converter

A conspicuous example of this is the increasing interest shown in the use of the cupola as an adjunct to the steel foundry and of the converter either for making finished steel or duplexing in combination with an electric open-hearth furnace.

Three new developments have combined to make the cupola-converter process much more attractive than was formerly the case. The first of these is the hot blast cupola which enables an all steel scrap charge to be melted and attain a high temperature in the molten metal. This allows great flexibility and an independent swing from iron to steel or vice versa in the charge to take advantage of the market conditions.

Desulphurization

The second is the further development of the soda-ash treatment of the molten iron for the removal of sulphur. This removes one of the principal objections to the use of cupola iron, especially where acid steel is made. An example of what can be done in sulphur removal was given in a private communication. Cupola iron which averaged 0.158 per cent S in samples taken from the spout was treated with soda ash. The average of eleven ladles showed a content of 0.042 per cent S after treatment.

A paper on the "Desulphurization of Pig Iron with Calcium Carbide," by Wood, Barrett and Holbrook, *Metals Technology*, December, 1939, indicates the possibility of lowering the sulphur to contents of less than 0.02 per cent or to contents much lower than is feasible with the use of alkalies.

Electric-Eye Control

The third is the adaptation of the "electric-eye" or photoelectric cell to the automatic control of the "blow" of a converter. This device is said to have great sensitivity and to be capable of stopping the blow at a precise carbon content, thus giving the highly desired control of composition.

Tests made have been reported so favorable that the next year should see some installations of cupolas to supply hot metal for open-hearth furnaces. The advantages are obvious in utilizing a cheaper charge, in utilizing the highly efficient cupola for melting and in increasing the capacity of the open hearth by shortening the time of a heat.

Electric Furnaces

Penton's Foundry List for 1939-1940 published in the Foundry, July, 1939, shows an increase of 10 electric steel foundries in U. S. for 1939 over 1937, or 215 in all. Cone in "Trends," *Metals and Alloys*, September, 1939, quotes one engineer conversant with trends in the electric steel industry as saying that more large electric furnaces are being installed and are likely to be installed than ever before. The tendency will be to produce in the electric furnaces some alloy steels now made in the open-hearth because, it is claimed, the trend in the cost of electric steel is downward. Contrary to this, the scrap and power situation led F. A. Melmoth in *Foundry*, January, 1940, to risk a prophecy that "assuming the price spread of scrap and pig iron is maintained as at present, and power costs experience no reduction, a return to popularity of the converter as a melting medium for many steel castings may be confidently expected."

An electric Tropenas furnace for alloy steels was described in the *Foundry Trade Journal*, December 28, 1939, page 448. In this apparatus the base steel of very low carbon content is first prepared by regular converter methods. Then a section of the furnace is removed and super-heating is accomplished by application of the electric arc. The alloying is done while operating as an electric furnace.

The process constitutes duplexing in a single container and, whereas it would have the advantages of duplexing, including the soda ash treatment of the cupola iron, there would obviously be some serious refractory problems.

Rotary Fuel Fired Furnace

The Sesci type of rotary, fuel-fired melting furnace continues to get considerable attention abroad. Faulkner in *Foundry Trade Journal*, Vol. 60, March 23, 1939, describes a plant at Cruve, England, in which two five-ton capacity Sesci furnaces are in operation. These are fired with

pulverized anthracite coal and are equipped with recuperators for preheating the air used for combustion. They are acid lined and the charge must be low enough in sulphur to allow a pickup of 0.012 per cent. Steel is made to chemical specifications and of acceptable physical quality. The biggest problem apparently concerns the short life of the refractories. Some work is being done on the use of basic refractories but no data are at present available.

Open Hearth

An experimental open-hearth furnace of unorthodox design has been built at the plant of E. J. Lavino & Company, for the primary purpose of testing refractories. The melting chamber is rectangular in shape and it is fired with oil burners placed in the long sides. Those burners are staggered with respect to those in the opposite wall and are tilted so that the flame impinges on the bath. The unique feature of this furnace is that the air for combustion is not preheated, yet it is claimed that steel baths have been heated to 3500° F. This is said to be possible because of the special type of burner used, which was designed by Dr. G. E. Seil of the same company.

Exothermic Processes

A number of exothermic processes for melting steel or alloys have been introduced and are now being tested. One of these is advocated by Maurice Stritmatter of Paris, France, for the production of small lots of expensive alloy steels, such as 18-8 stainless. The process apparently makes use of the well-known thermit reaction to melt stainless steel scrap, ferrochromium and nickel shot in the correct proportions, although it is claimed that there are important deviations from the usual thermit reactions. A member of this committee having witnessed a test reports that steels of correct analysis and suitable castability can be produced in this manner, and a foundry not equipped with a sufficiently small melting unit might utilize this process for the production of small, high alloy castings, urgently needed. In this case cost would not be the determining factor.

Another method utilizes a silicothermic reaction to produce molten ferrochromium for alloying steel or iron. Two products of this nature are produced, one a low-carbon and the other a high-carbon material. They are supplied in package form as power or briquettes with a definite weight of chromium in each package. They are used for alloying steel by placing a known quantity on a steel bath, container and all, either in the furnace or ladle. The hot steel starts the exothermic reaction which produces ferrochromium and a fluid slag. The alloying is thus accomplished quickly and without changing the temperature of the bath.

Chrom-X is advocated for ladle additions wherever possible and it is claimed that in this use a consistent recovery of 90-95 per cent of the chromium is obtained. Low carbon Chrom-X, added in the furnace, has been used to make 5 per cent and 12 per cent Cr steels in an open-hearth furnace. The purported advantages of Chrom-X are in lowering costs through shortening the time of a heat, alloying without chilling the bath, and greater flexibility and accuracy in alloying.

Rapid Carbon Determinations

Two new instruments for rapid determinations of preliminary carbons have been introduced in the last couple of years. One of these is the "carbonalyser" described by Work and Clark in *Metals Technology*, December, 1939, and the other was described by Blosjo in the *Transactions* of the American Foundryman's Association in 1939. Both of these instruments are attractive because of low cost, ruggedness, simplicity and portability. Reports from the field by those who have been using them indicate a very satisfactory degree of accuracy for them.

Temperature Measurements

Because of the variation in emissivity of metals and slags, which leads to uncertainty in applying correction factors, plus the inherent error due to smoke or fume, optical temperature readings of molten steel leave something to be desired. For this reason considerable interest has been shown in the use of thermocouples for this purpose.

The Fitterer couple of graphite-silicon carbide has been used somewhat in this country but in England a great deal of work has been done with platinum-platinum-rhodium and tungsten molybdenum couples. This latter work and the apparatus used is described in detail in the Iron and Steel Institute (British) Special Report No. 25 which is included in the Eighth Report on the Heterogeneity of Steel Ingots.

In Sweden, Fornander and Omberg (Jernkontorets Annaler, Nov. 1939) likewise experimented with, and are favorably impressed by, the tungsten-molybdenum couple.

New A. S. T. M. Non-Ferrous Casting Specifications

A.S.T.M. Committee B-5 on Copper and Copper Alloys, Cast and Wrought has prepared seven new specifications for non-ferrous castings and on one specification for copper-base alloys in ingot form. In all specifications, compositions are given a classification in accordance with A.S.T.M. tentative standard B119-40T, a numerical and a commercial designation. Specifications being voted on include those for copper-base alloys in ingot form and specifications for sand cast tin bronze and leaded tin bronze, high lead tin bronze, leaded red brass and leaded semi-red brass, leaded yellow brass, high strength yellow brass and leaded high strength yellow brass, aluminum bronze, and leaded nickel brass and leaded nickel bronze.

A. F. A. Committee Personnel

1940-1941

General Committees

Board of Awards

H. S. Washburn, *Chairman* (President 1939-40)
Marshall Post (President 1938-39)
H. Bornstein (President 1937-38)
James L. Wick, Jr. (President 1936-37)
D. M. Avey (President 1934-36)
Frank J. Lanahan (President 1933-34)
T. S. Hammond (President 1932-33)

Nominating Committee

H. Bornstein, *Chairman* (President 1937-38)
Marshall Post (President 1938-39)
H. S. Washburn (President 1939-40)

Elected Members:	*Alternates:*
R. K. Glass	M. W. Pohlman
H. F. McFarlin	F. L. Wolf
F. A. Melmoth	M. F. Doty
C. V. Nass	S. C. Wasson

Technical Committees*

General Interest Committees

1 International Relations Committee

F. G. Steinebach, *Chairman* — V. E. Minich
W. R. Bean — Marshall Post
Vincent Delport — H. A. Schwartz

1-a European Representative

Vincent Delport

1-b Committee on Analysis of Casting Defects

W. A. Hambley, *Chairman*
E. J. Carmody, *Vice Chairman* — A. S. Nichols
F. W. Hintze, *Secretary* — F. L. Overstreet
A. J. Busch — W. G. Reichert
R. K. Glass — F. L. Weaver
John L. Lowe — W. C. Wine
W. B. McFerrin — Charles Zahn

2 Foundry Cost Committee

R. L. Lee, *Chairman* (Representing Gray Iron Founders' Society)
J. D. Burlie (Representing Gray Iron Div.)
R. L. Collier (Representing Steel Founders' Society)
W. J. Corbett (Representing Steel Founders' Society)
V. L. Diefenbacher (Representing Gray Iron Div.)
G. E. Hels (Representing Gray Iron Div.)
S. Kitto (Representing Malleable Div.)
E. J. Metzger (Representing Non-Ferrous Div.)
C. S. Roberts (Representing Steel Founders' Society)
E. H. Roeming (Representing Gray Iron Div.)
J. A. Wagner (Representing Malleable Div.)

3 Apprentice Training Committee

J. G. Goldie, *Chairman*
J. A. Bowers — V. J. Hydar
S. M. Brah — J. Morgan Johnson
Frank C. Cech — J. E. Kemp
H. L. Charlson — G. W. Merrifield
Franklin Farrel III — W. H. Ruten
C. J. Freund — Wayne Stettbacher
J. E. Goss — J. R. Van Kooy
John Grennan — C. W. Wade
F. W. Hunter — A. H. Wornom

3-a Subcommittee on Apprentice Contest

S. M. Brah, *Chairman* — J. G. Goldie
Frank C. Cech — J. Morgan Johnson
H. L. Charlson — C. W. Wade

3-b Subcommittee on Program and Papers

Franklin Farrel III — J. E. Goss
C. J. Freund

3-d Subcommittee on Revision of Four-Year Foundry Apprenticeship Standards

J. Morgan Johnson, *Chairman* — J. G. Goldie
S. M. Brah — John Grennan

4 Program and Papers*

Policy Committee

F. J. Walls, *Chairman* — G. P. Phillips
D. P. Forbes — Wm. Romanoff
A. W. Gregg — D. C. Zuege

4-b Foreman Training Committee

A. D. Lynch, *Chairman* — W. E. George
E. A. Bacon — G. J. Leroux
W. G. Conner, Jr. — A. C. Ziebell

4-c Job Evaluation and Time Study Committee

F. E. Wartgow, *Chairman* — E. J. Metzger
James Bird — H. C. Robson
Eugene Bouton — J. A. Westover

4-d Plant and Plant Equipment Committee

W. R. Jennings, *Chairman*
E. W. Beach — James Thomson

*For Program and Papers Committee on Steel, Malleable, Gray Iron and Non-Ferrous, see respective Divisions.

4-e Refractories Committee

J. A. Bowers, *Chairman* — A. V. Leun
C. E. Bales — John Lowe
E. J. Carmody — G. K. Minert
A. H. Dierker — R. E. Wilke

4-f Sand Shop Operation Course Committee

E. E. Woodliff, *Chairman* — D. F. Sawtelle
D. Frank O'Connor — Donald Lee Yost

4-g Lecture Course Committee

H. M. St. John, *Chairman*
H. Bornstein — John Howe Hall

6 Foundry Sand Research Committee

Dr. H. Ries, *Technical Director** — N. F. Hindle, *Secretary*

6-a Executive Committee

Function—To direct the work of the Foundry Sand Research Committee and to pass on recommendations made by its various subcommittees.

Dr. H. Ries, *Chairman*
N. F. Hindle, *Secretary*
C. M. Saeger, Jr. (National Bureau)
H. W. Dietert (Sand Testing Equipment)
C. Mathiesen (Sand Producer)
N. J. Dunbeck (Bond Producer)
C. P. Randall (Castings Producer—G.I.)
W. G. Reichert (Castings Producer—G.I.)
D. L. Parker (Castings Producer—Steel)
W. Finster (Castings Producer—Steel)
E. C. Zirow (Castings Producer—Malleable)
Bert Stone (Castings Producer—Malleable)
G. K. Eggleston (Castings Producer—Non-Ferrous)
C. V. Nass (Castings Producer—Non-Ferrous)
A. C. Davis (University)

6-a-1 Advisory Committee

Function—To assist the Executive Committee by giving advice on various projects and actions undertaken by the Foundry Sand Research Committee.

H. L. Daasch (University)
W. M. Saunders (Private Laboratory)
L. B. Knight, Jr. (Sand Preparation Equipment)
H. A. Deane (Castings Producer—G.I.)
H. B. Hanley (Castings Producer—G.I.)
F. A. Melmoth (Castings Producer—Steel)
H. A. Schwartz (Castings Producer—Malleable)
Robert H. Mooney (Castings Producer—Malleable)
F. L. Wolf (Castings Producer—Non-Ferrous)
W. M. Ball, Jr. (Castings Producer—Non-Ferrous)
Stanton Walker (Sand Association)
F. L. Weaver (Sand Producer)
H. E. Donnocker (Sand Producer)
L. C. Wilson (Advisor Management)
D. P. Forbes (Advisor Management)
H. Bornstein (Advisor Management)
J. L. Wick, Jr. (Advisor Management)

6-b Testing Committees

6-b-1 Subcommittee on Rebonding Clays

Function—To recommend special tests to determine the value of bonding clays.

R. E. Morey, *Chairman*
W. M. Ball, Jr. — R. E. Grim
Paul Bechtner — W. B. McFerrin
N. J. Dunbeck — F. L. Overstreet
P. Chas. Fuerst — Bert Stone
(Two user representatives to be appointed.)

6-b-2 Subcommittee on Hardness Testing

Function—To develop satisfactory methods for testing the hardness of molds and cores.

H. W. Dietert, *Chairman* — Ray Tegman
C. P. Randall — E. E. Woodliff
(One steel and one malleable representative to be appointed.)

6-b-3 Subcommittee on Durability

Function—To devise a satisfactory, reliable and, if possible, simple method for determining the durability of foundry sands.

C. E. Schubert, *Chairman*
H. W. Dietert — R. A. Gezelius
N. J. Dunbeck — G. A. Schumacher

6-b-4 Subcommittee on Grading and Fineness

Function—To suggest means for determining the fineness of sands and to suggest methods for grading sands and clays.

W. G. Reichert, *Chairman* — C. Mathiesen
H. W. Dietert — C. M. Saeger, Jr.
G. K. Eggleston — E. C. Zirow

6-b-5 Subcommittee on Flowability

Function—to determine and recommend a test for determining flowability of foundry sands.

P. E. Kyle, *Chairman* — C. M. Saeger, Jr.
H. W. Dietert — D. F. Sawtelle
W. G. Reichert — R. E. Wilke

6-b-6 Subcommittee on Compression Tests—Discontinued

*Ex-officio member of all committees.

6-b-7 Subcommittee on Physical Properties of Foundry Sands at Elevated Temperatures

Function—To determine the physical properties of various sands and binders at elevated temperatures and to recommend methods for determining such properties.

D. L. Parker, *Chairman*

C. W. Briggs — W. C. Hamilton
A. C. Davis — Howard Mason
H. W. Dietert — C. P. Randall
W. Finster — W. G. Reichert
R. A. Gezelius — D. C. Zuege

6-b-8 Subcommittee on Sintering Test

Function—To determine the proper technique and outline the possible pitfalls in the performance of the sintering test together with a complete investigation as to the accuracy of the present test and if necessary, suggest revisions to increase accuracy.

Chairman (To be appointed) — W. G. Reichert
J. B. Caine — C. M. Saeger, Jr.
H. W. Dietert — H. F. Taylor

6-b-9 Subcommittee on Effect of Sands on the Properties of Castings

Function—To study the effect of sand properties on the properties of castings.

H. Womochel, *Chairman* — M. H. Gould
H. W. Dietert — R. E. Morey

6-c Publications Committees

6-c-1 Subcommittee on Pamphlet on Sand Properties

Function—To prepare and publish a book which would explain in simple terms the effect of different variables on foundry sands and the relation of said variables to one another for the purpose of assisting the practical foundrymen in the solution of difficulties attributable to foundry sands.

Dr. H. Ries, *Chairman* — C. P. Randall
M. P. Davis — W. G. Reichert
H. W. Dietert — F. L. Weaver

6-c-2 Subcommitee on Nomenclature

Function—To clarify terms applied to the physical properties of foundry sands and to recommend such additional terms as may be required from time to time by future investigations.

A. C. Davis, *Chairman*

H. W. Dietert — John Grennan

6-c-3 Subcommittee on Papers Review

Function—To review and pass on papers submitted to the Foundry Sand Research Committee for presentation at the annual convention and for inclusion in the Transactions of the Association.

C. P. Randall — W. G. Reichert
Dr. H. Ries

6-d Committee on Sand Purchase Forms—Discontinued

6-e Committee on Non-Ferrous Sands—Discontinued

6-f Special Representatives on Other Associations

6-f-1 N.I.S.A. Foundry Sand Research Committee

Dr. H. Ries

6-f-2 A.F.A. Steel Division Representative on Foundry Sand Research

D. L. Parker

6-f-3 A.F.A. Non-Ferrous Division Representative on Foundry Sand Research

C. M. Saeger, Jr.

6-f-4 A.F.A. Representative on A.S.A. Project Z-23, Specifications for Sieves for Testing Purposes

Dr. H. Ries

10 Industrial Hygiene Codes Committee

James R. Allan, *General Chairman*

E. O. Jones, *Secretary* — Nathan Lesser
F. H. Amos — J. G. Liskow
E. E. Birkland — R. W. McCandlish
C. P. Guion — S. McMullan
Carl F. Larsson — John F. Tobin

10-a Subcommittee on Non-Ferrous Melting

E. E. Birkland — S. McMullan

10-b Subcommittee on Foundry Industry Code

E. O. Jones, *Chairman*
James R. Allan
E. E. Birkland
S. McMullan

Conferees:
C. S. Anderson
E. H. Ballard
J. O. Houze
A. B. Root, Jr.
L. S. Peregoy

10-c Subcommittee on Foundry Parting

James R. Allan, *Chairman*

22 Representatives on Other Society Committees and Cooperative Projects

22-a Representative on Alloys of Iron Research-Engineering Foundation

J. T. MacKenzie

22-b Representatives on Joint Committees on Foundry Refractories

James R. Allan — J. A. Kayser
E. J. Carmody — R. E. Kennedy

22-c Representatives on International Committee on Testing Cast Iron

W. H. Spencer

22-d Representative on Committee, Division of Simplified Practice, National Bureau of Standards, R58-36, Classification of Iron and Steel Scrap

D. P. Hopkins

24 A.F.A. Representatives of Committees of the American Society for Testing Materials

24-a A-1, on Steel

E. W. Campion

24-b A-3, on Cast Iron

W. H. Spencer

24-c A-3, Subcommittee II, on Cast Iron Pipe

D. P. Hopkins — H. W. Stuart, *Alternate*

24-d A-3, Subcommittee IV, on Car Wheels

F. K. Vial

24-e A-4, on Heat Treatment of Iron and Steel

E. Touceda

24-f A-7, on Malleable Iron Castings

H. A. Schwartz

24-g B-2, Subcommittee I, on Pure Metals in Ingot Form

G. H. Clamer

24-h B-5, on Copper Base Alloys

F. L. Wolf

24-i C-8, on Refractories

James R. Allan

24-j D-5, on Coal and Coke

J. T. MacKenzie

24-k E-1, on Methods of Testing

L. C. Wilson

24-l E-7, on Radiography

C. W. Briggs

24-m E-4, on Metallography

H. A. Schwartz

24-n B-7, on Light Metals and Alloys

Subcommittees I and II—A. Sugar
Subcommittee IV—M. E. Brooks

24-o Committee on Corrosion

J. T. MacKenzie

30 A.F.A. Representatives on Committees Functioning Under the American Standards Association

30-a Project A-21, Specifications for Cast Iron Pipe and Special Castings

D. P. Hopkins

30-b Project A-35, Manhole Frames and Covers

C. J. P. Hoehn — R. E. Moore
E. B. Smith

30-e Project B-19, Safety Code for Compressed Air Machinery

James Prendergast

30-f Project B-20, Safety Code for Conveyors and Conveying Machinery

S. B. Hansen

30-g Project B-30, Safety Code for Cranes, Derricks and Hoists

A. H. McDougall

30-h Project H-13 (1925), Sectional Committee on Outside Dimensions of Plumbago Crucibles for Non-Tilting Furnaces in Non-Ferrous Foundry Practice

N. K. B. Patch

30-j Project Z-9, Safety Code for Exhaust Systems

James R. Allan — O. E. Mount

30-k Project Z-14, Standards for Drawing and Drafting Room Practice

E. F. Cone

30-n Project Z-23, Specifications for Sieves for Testing Purposes

H. Ries

30-p Classification and Designation of Surface Qualities

E. F. Cone

30-q Mechanical Standards

L. M. Sherwin

49 Divisional Activities Correlation Committee

H. Bornstein, *Chairman* — W. J. Laird
C. R. Culling — Vaughan Reid
D. P. Forbes — W. H. Spencer
John Howe Hall — F. J. Walls

49-a Policy Committee on Handbook Revision

H. Bornstein, *Chairman*

E. K. Smith — J. H. Lansing
F. A. Melmoth — H. M. St. John

Divisions

50 Gray Iron Division

W. H. Spencer*, *General Chairman*
F. J. Walls, *Vice Chairman*

50-a Advisory Committee

W. H. Spencer, *Chairman*
F. J. Walls, *Vice Chairman*
A. L. Boegehold
J. W. Bolton; *Alt.:* M. Milligan
H. Bornstein
E. Bremer
V. A. Crosby
Pat Dwyer
John Erler
H. C. Griggs
R. F. Harrington
Robert Job
Max Kuniansky
C. H. Lorig
J. T. MacKenzie
W. E. Mahin
R. G. McElwee
P. E. McKinney
G. P. Phillips
K. H. Priestley
W. H. Rother
C. M. Saeger, Jr.
F. G. Sefing
E. K. Smith
J. S. Vanick
E. R. Young

50-b Committee on Pig Iron Qualities

J. T. MacKenzie, *Chairman*
A. L. Boegehold
D. P. Hopkins; *Alt.:* H. W. Stuart

50-d Committee on Fluidity Testing

W. H. Spencer, *Chairman*
C. W. Briggs
C. K. Donoho
G. P. Halliwell
C. F. Joseph
Max Kuniansky
C. M. Saeger, Jr.

50-f Committee on Welding Cast Iron

F. J. Walls, *Chairman*
R. R. Deas, Jr.

50-g Committee on Classification of Graphite in Gray Iron—in Cooperation with A.S.T.M. Committee A-3, Subcommittee VII, on Microstructure of Cast Iron.

W. E. Mahin, *Chairman*
J. W. Bolton; *Alt.:* A. J. Smith
Alfred Boyles
G. P. Phillips
P. C. Rosenthal

50-h Representative on International Committee on Cast Iron Test Bars

W. H. Spencer

50-i Representative on A.S.T.M. Committee A-3, Subcommittee II, on Cast Iron Pipe

D. P. Hopkins; *Alt.:* H. W. Stuart

50-j Representative on A.S.T.M. Committee A-3, Subcommittee IV, on Car Wheels

F. K. Vial

50-k Representative on A.S.T.M. Committee D-5, on Coal and Coke

J. T. MacKenzie

50-l Representative on A.S.T.M. Conference on Coordination of American Corrosion Activities

J. T. MacKenzie

50-m Representative on Ferrous Metals, Advisory to U.S. Bureau of Standards

H. Bornstein
J. T. MacKenzie

50-n Committee on Program and Papers

F. J. Walls, *Chairman*
R. A. Clark
H. A. Deane
F. J. Dost
Pat Dwyer
T. E. Eagan
Paul S. Lane
R. G. McElwee
G. P. Phillips
Harry Rayner

50-o Shop Operation Course Committee

K. H. Priestley, *Chairman*
John Grennan, *Vice Chairman*
P. T. Bancroft
C. O. Butler
R. F. Hine
J. A. Woody
A. S. Wright

50-q Committee on Handbook Revision

E. K. Smith, *Chairman*
(Committee to be appointed)

50-r Committee on Definition of Foundry Terms

Pat Dwyer, *Chairman*
C. C. Brisbois
John Grennan

50-s Committee on Cooperation with Engineering Schools

F. G. Sefing, *Chairman*
H. Bornstein
C. H. Casberg
R. R. Deas, Jr.
John Grennan
H. H. Judson
P. E. Kyle
J. T. MacKenzie
S. C. Massari
F. G. Steinebach

50-t Committee on Cupola Research

A. L. Boegehold, *Chairman*
H. Bornstein
H. Kenneth Briggs
A. E. Caudle
G. S. Evans
A. W. Gregg
L. C. Hewitt
T. G. Johnston
J. A. Kayser
Max Kuniansky
John Lowe
J. T. MacKenzie
S. C. Massari
Lewis D. McClaren
R. G. McElwee
W. O. McMahon
B. P. Mulcahy
B. C. O'Brien
G. P. Phillips
C. S. Reed, Jr.
D. B. Reeder
E. K. Smith
F. J. Walls

50-t-1 Subcommittee on Equipment

A. W. Gregg, *Chairman*
M. J. Bradley
A. E. Caudle
W. A. Hambley
W. R. Jennings
W. C. Juram
John Lowe
J. T. MacKenzie
B. A. Miller
B. C. O'Brien
W. Lee Roueche
L. C. Smith
P. T. Sprague

50-t-2 Subcommittee on Ferrous Materials and Alloys

R. G. McElwee, *Chairman*

50-t-2a Subcommittee on Pig Iron

T. G. Johnston, *Chairman*
B. H. Booth
Fred Carl
A. H. Dierker
R. A. Donaldson
H. W. Johnson
T. L. Joseph
M. J. Lefler
R. A. Lindgren
W. O. McMahon
W. G. Reichert
J. E. Reynolds
H. M. Rich

50-t-2b Subcommittee on Scrap

Max Kuniansky, *Chairman*
H. Bornstein
D. Meloche
L. W. Pryse
W. G. Reichert
E. K. Smith
H. W. Stuart

50-t-2c Subcommittee on Alloys

R. G. McElwee, *Chairman*
T. E. Barlow
G. F. Comstock
V. A. Crosby
V. H. Schnee
E. K. Smith
F. J. Walls

50-t-3 Subcommittee on Slags, Fluxes and Desulphurizers

G. S. Evans, *Chairman*
W. Van N. Baker
Wayne Cockrell
A. W. Demmler
A. H. Dierker
H. H. Judson
M. J. Lefler
C. H. Lorig
J. T. MacKenzie
L. H. Rudesill
F. W. Scott

50-t-4 Subcommittee on Fuels and Combustions

S. C. Massari, *Chairman*
H. L. Comin
G. C. Creusere
J. T. MacKenzie
B. P. Mulcahy
R. A. Sherman
T. J. Wood

50-t-5 Subcommittee on Operation and Process

G. P. Phillips, *Chairman*
E. Bremer
H. Kenneth Briggs
John Grennan
W. A. Hambley
Fulton Holtby
C. F. Joseph
J. J. Kanter
M. J. Lefler
W. Levi
John Lowe
J. T. MacKenzie
L. B. Thomas
F. J. Walls
R. E. Wilke

50-t-6 Subcommittee on Refractories

C. S. Reed, Jr., *Chairman*
J. A. Kayser, *Vice Chairman*
C. E. Bales
M. C. Booze; *Alt.:* K. W. Smith
E. J. Carmody
R. A. Clark
J. O. Everhart
L. C. Hewitt
J. T. MacKenzie
P. J. May
R. S. Moore
J. D. Sullivan

51 Steel Division

John Howe Hall*, *General Chairman*

51-a Advisory Committee

John Howe Hall, *Chairman*
T. N. Armstrong
C. W. Briggs
E. W. Campion
L. E. Everett
R. A. Gezelius
A. W. Gregg
Fred Grotts
C. H. Lorig
P. E. McKinney
F. A. Melmoth
R. S. Munson
D. L. Parker
H. D. Phillips
H. M. Rishel
C. E. Sims
L. C. Wilson
S. V. Wood
D. C. Zuege

51-b Committee on Handbook Revision

(Committee to be appointed)

51-c Committee on Methods of Producing Steel for Castings

C. E. Sims, *Chairman*
J. B. Caine
Ernest Lancashire
F. A. Melmoth
H. D. Phillips
W. J. Phillips
E. C. Troy
R. C. Woodward

51-d Committee on Heat Treatment of Steel Castings

D. C. Zuege, *Chairman*
H. H. Blosjo
Werner Finster
R. A. Gezelius
C. T. Greenidge
E. R. Young

51-e Committee on Radiography Study of Steel Castings

C. W. Briggs, *Chairman*
J. J. Curran
R. H. Frank
W. C. Hamilton
G. F. Landgraf
P. E. McKinney
E. W. Page
L. C. Wilson

51-g Committee on Impact Testing

L. C. Wilson, *Chairman*
(Committee to be appointed)

51-h Representative on Committee on Foundry Sand Research

D. L. Parker

51-i Representative on A.I.M.E. Open-Hearth Committee

C. E. Sims

51-k Representative on A.S.T.M. Committee A-1, Specifications for Steel

E. W. Campion

51-l Representative on A.S.T.M. Committee E-1, Methods of Testing

L. C. Wilson

51-m Representative on A.S.T.M. Committee E-7, Radiography of Cast Steel

C. W. Briggs
John Howe Hall

51-n Representative on Ferrous Metals Committee, Advisory to National Bureau of Standards

P. E. McKinney

*Ex-officio member of all committees.

51-o Committee on Program and Papers
T. N. Armstrong, *Chairman*
H. H. Blosjo
J. W. Bolton;
Alt.: M. Milligan
E. Bremer
John Erler
L. E. Everett
W. C. Hartmann
G. A. Lilliequist
D. C. Zuege

51-p Committee on Round Table Conference
R. S. Munson, *Chairman*
A. H. Jameson
G. A. Lilliequist
T. D. West

52 Malleable Division
D. P. Forbes*, *General Chairman*

52-a Advisory Committee
D. P. Forbes, *Chairman*
C. S. Anderson
P. C. DeBruyne
A. M. Fulton
C. F. Joseph
J. H. Lansing
H. W. Maack
H. A. Schwartz
E. K. Smith
R. J. Teetor
L. J. Wise
D. M. Storie

52-b Committee on Specifications
H. A. Schwartz, *Chairman*
K. H. Hamblin
R. L. Ogden

52-c Committee on Handbook Revision
J. H. Lansing, *Chairman*
(Committee to be appointed)

52-d Representative on A.S.T.M. Committee A-4, Subcommittee II, on Heat Treatment of Iron and Steel
E. Touceda

52-e Representative on A.S.T.M. Committee A-7, Malleable Casting Specifications
H. A. Schwartz

52-f Representative on A.S.T.M. Committee E-4, on Metallography
H. A. Schwartz

52-g Committee on Program and Papers
C. F. Joseph, *Chairman*
R. J. Anderson
D. I. Dobson
L. A. Dunn
A. D. Forbes
A. M. Fulton
K. H. Hamblin
J. H. Lansing
C. C. Lawson
W. D. McMillan
D. F. Sawtelle
P. R. Schilling
G. A. Schumacher
F. L. Wolf

52-h Committee on Round Table Conference
A. M. Fulton
P. C. DeBruyne
J. H. Lansing

53 Non-Ferrous Division*
Wm. J. Laird,** *General Chairman*, 1940-42
Wm. Romanoff, *Vice Chairman*, 1940-42

53-a Advisory Committee
Wm. J. Laird, *Chairman*, 1940-42
Wm. Romanoff, *Vice Chairman*, 1940-42
Harold J. Roast, *Past Chairman*, 1940-42
N. F. Hindle, *Secretary*
H. B. Gardner, 1940-44
E. F. Hess, 1940-44
John W. Kelin, 1940-44
C. V. Nass, 1938-42
R. W. Parsons, 1938-42
T. C. Watts, 1938-42
R. W. Parsons (*Chairman*, Program and Papers Committee)
G. K. Eggleston (*Chairman*, Recommended Practices Committee)
H. L. Smith (*Chairman*, Research Committee)
C. V. Nass (*Chairman*, Round Table Committee)

53-b Program and Papers Committee
R. W. Parsons, *Chairman*, 1939-41
E. Bremer, 1940-44
M. V. Healey, 1938-42
John W. Kelin, 1940-44
L. W. Kempf, 1939-43
J. E. McNulty, 1938-42
Wm. Romanoff, 1937-41
T. C. Watts, 1937-41
N. A. Ziegler, 1939-43

53-c Recommended Practices Committee
G. K. Eggleston, *Chairman*, 1940-42; *Member*, 1938-42
M. E. Brooks, 1939-43
A. E. Cartwright, 1940-44
D. M. Curry, 1940-44
W. B. George, 1939-43
E. F. Hess, 1938-42
E. G. Jennings, 1939-43
D. Frank O'Connor, 1940-44
H. J. Rowe, 1938-41
S. A. Weigand, 1940-44

53-c-1 Subcommittee on Red Brass
G. K. Eggleston, *Chairman*

53-c-2 Subcommittee on Tin Bronze
E. F. Hess, *Chairman*
J. W. Bolton

53-c-3 Subcommittee on Nickel Alloys
D. M. Curry, *Chairman*
(Membership to be appointed)

53-c-4 Subcommittee on Silicon Bronzes
E. G. Jennings, *Chairman*
(Membership to be appointed)

53-d Round Table Conference Committee
C. V. Nass, *Chairman*, 1940-41; *Member*, 1939-41
A. C. Boak, 1939-43
John W. Clarke, 1940-44
B. A. Miller, 1940-44
C. O. Thieme, 1938-42

*Ex-officio member of all committees.
*Committee members elected or appointed for the term indicated in listing.
**Ex-officio member of all committees.

53-e Research Committee
H. L. Smith, *Chairman*, 1939-41
H. B. Gardner, 1938-42
J. M. Kelly, 1940-44
H. B. Reed, 1939-43

53-g Handbook Revision Committee
H. M. St. John, *Chairman*
(Membership to be appointed)

53-h Representatives on Other Association Committees
A.F.A. Committee on Fluidity Testing—G. P. Halliwell
A.F.A. Committee on Molding Sand Research—C. M. Saeger, Jr.
A.F.A. Cost Committee—E. J. Metzger
A.F.A. Foundry Refractories—A. E. Cartwright
A.F.A. Handbook Policy Committee—H. M. St. John
A.S.T.M. Committee B-2, Subcommittee 1, on Pure Metals in Ingot Form—G. H. Clamer
A.S.T.M. Committee B-5 on Copper Base Alloys—F. L. Wolf
A.S.T.M.—Committee B-7 on Light Metals and Alloys
Subcommittees I and II—A. Sugar
Subcommittee IV—M. E. Brooks
National Bureau of Standards, Advisory Committee, Non-Ferrous Metals—Sam Tour

54 Patternmaking Division
Vaughan Reid*, *General Chairman*
Frank C. Cech, *Vice Chairman*

54-a Advisory Committee
Vaughan Reid, *Chairman*
Frank C. Cech, *Vice Chairman*
C. N. Henning
E. T. Hynan
W. V. Johnson
E. T. Kindt
J. A. Leisk
A. Pyle, Jr.
V. J. Sedlon
L. M. Sherwin

*Ex-officio member of all committees.

A.F.A. Organization and Personnel*

Allan, James R., Assistant Mgr., Ind. Engrg. & Const. Div., International Harvester Co., 180 N. Michigan Ave., Chicago, Ill. (10, 10-b, 10-c, 22-b, 24-i, 30-j)

Amos, F. H., Engr., Ind. Engrg. & Const. Div., International Harvester Co., 180 N. Michigan Ave., Chicago, Ill. (10)

Anderson, C. S., Pres., Belle City Malleable Iron Co., Racine, Wis. (10-b, 52-a)

Anderson, R. J., Supt., Belle City Malleable Iron Co., Racine, Wis. (52-g)

Armstrong, T. N., Met., International Nickel Co., 67 Wall St., New York City (51-a, 51-o)

Avey, D. M., 2604 S. Trenton, Tulsa, Okla. (Board of Awards)

Bacon, E. A., Pres., Smith Steel Foundry Co., 1320 S. First St., Milwaukee, Wis. (4-b)

Baker, W. Van N., Met., Standard Foundry Co., Worcester, Mass. (5-dt-3)

Bales, C. E., Vice Pres., Ironton Firebrick Co., Ironton, O. (4-e, 50-t-6)

Ball, W. M., Jr., Fdry. Supt., Edna Brass Mfg. Co., 528 Reading Rd., Cincinnati, O. (6-al, 6-bl)

Ballard, E. H., Gen. Fdry. & Patt. Shop. Supt., General Electric Co., 920 Western Ave., West Lynn, Mass. (10-b)

Bancroft, P. T., 2411 23rd Ave. B, Moline, Ill. (50-o)

Barlow, T. E., Vanadium Corp. of America, 2440 Book Tower, Detroit, Mich. (50-t-2-c)

Bean, W. R., Vice Pres., Whiting Corp., Harvey, Ill. (1)

Beach, E. W., Engrg. Executive, Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich. (4-d)

Bechtner, Paul, Mgr., American Colloid Co., 363 W. Superior St., Chicago, Ill. (6-b-1)

Bird, James, Asst. Supt., The Liberty Foundry, Inc., Wauwatosa, Wis. (4-c)

Birkland, E. E., Factory Engrg. Dept., Crane Co., 4100 S. Kedzie Ave., Chicago, Ill. (10, 10-a, 10-b)

Blosjo, H. H., Met., Minneapolis Electric Steel Casting Co., 3800 N. E. 5th St., Minneapolis, Minn. (51-d, 51-o)

Boak, A. C., Met., Empire Brass Mfg. Co., Ltd., London, Ont., Canada (53-d)

Boegehold, A. L., Head, Met. Dept., General Motors Research Lab., 485 W. Milwaukee, Detroit, Mich. (50-a, 50-b, 50-t)

Bolton, J. W., Met., Lunkenheimer Co., Beekman & Waverly Aves., Cincinnati, O. (50-a, 50-g, 51-o, 53-c-2)

Booth, B. H., Met., Jackson Iron & Steel Co., Jackson, O. (50-t-2-a)

Booze, M. C., Vice Pres., Chas. Taylor Sons Co., P. O. Box 58, Cincinnati, O. (50-t-6)

Bornstein, H., Director, Testing & Research Lab., Deere & Co., Moline, Ill. (Board of Awards, Nominating Committee, 4-g, 6-a-1, 49, 49-a, 50-a, 50-m, 50-s, 50-t, 50-t-2-b)

Bouton, Eugene, Supv., Time Motion Study, J. I. Case Co., Racine, Wis. (4-c)

Bowers, J. A., Melting Supt., American Cast Iron Pipe Co., Birmingham, Ala. (3, 4-e)

Boyles, Alfred, Met. Battelle Memorial Institute, 505 King Ave., Columbus, O. (50-g)

Bradley, M. J., Market Extension Engr., Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa. (50-t-1)

Brah, S. M., Ind. Coordinator, International Correspondence Schools, 360 N. Michigan Ave., Chicago, Ill. (3, 3-a, 3-d)

Bremer, E., Met. Editor, The Foundry, Penton Bldg., Cleveland, O. (50-a, 50-t-5, 51-o, 53-b)

Briggs, C. W., Tech. Adviser, Steel Founders' Society of America, 920 Midland Bldg., Cleveland, O. (6-b-7, 241, 50-d, 51-a, 51-e, 51-m)

*Membership on committees listed on preceding pages is shown by respective numbers and letters as given in parentheses.

Briggs, H. Kenneth, 4000 W. Washington Blvd., Chicago, Ill. (50-t, 50-t-5)

Brisbois, C. C., Fdry. Supt., Robert Mitchell Co., Ltd., 102 Monkland Blvd., St. Laurent, Que., Canada (50-r)

Brooks, M. E., Met., Dow Chemical Co., Midland, Mich. (24-n, 53-c, 53h)

Burlie, J. D., Fdry. Engr., Western Electric Co., Dept. 7713-F, Bldg. 54-1, Hawthorne Station, Chicago, Ill. (2)

Busch, A. J., Fdry. Engr., C. C. Kawin Co., 431 S. Dearborn St., Chicago, Ill. (1-b)

Butler, C. O., Supt., Warren Pipe Co. of Mass., Inc., Everett, Mass. (50-o)

Caine, J. B., Met., Sawbrook Steel Castings Co., Lockland, O. (6-b-8, 51-c)

Campion, E. W., Pres., The Bonney-Floyd Co., 611 Marion Rd., Columbus, O. (24-a, 51-a, 51-k)

Carl, Fred, Asst. Fdry. Supt., Delco-Remy Div., General Motors Corp., Anderson, Ind. (50-t-2-a)

Carmody, E. J., Met., C. C. Kawin Co., 431 S. Dearborn St., Chicago, Ill. (1-b, 4-e, 22-b, 50-t-6)

Cartwright, A. E., Met., Robert Mitchell Co., Ltd., 102 Monkland Blvd., St. Laurent, Que., Canada (53-c, 53-h)

Casberg, C. H., Prof. of Mech. Engrg., University of Illinois, Urbana, Ill. (50-s)

Caudle, A. E., Sales Engr., Blower & Compressor Dept., Allis-Chalmers Mfg. Co., Milwaukee, Wis. (50-t, 50-tl)

Cech, Frank C., Pattern Instructor, Cleveland Trade School, 535 Eagle Ave., Cleveland, O. (3, 3-a, 54, 54-a)

Charlson, H. L., Asst. Supt., American Steel Foundries, E. Chicago, Ind. (3, 3-a)

Clamer, G. H., Pres., Ajax Metal Co., 46 Richmond St., Philadelphia, Pa. (24-g, 53-h)

Clark, R. A., Met., Lakey Foundry Co., Muskegon, Mich. (50-n, 50-t-6)

Clarke, John W., Asst. Supt., Fdry. Div., General Electric Co., East Lake Road, Erie, Pa. (53-d)

Cockrell, Wayne L., Asst. Prof. of Mech. Engrg., Michigan State College, E. Lansing, Mich. (50-t-3)

Collier, R. L., Secy., Steel Founders' Society of America, 920 Midland Bldg., Cleveland, O. (2)

Comin, H. L., Plant Mgr., Indiana Gas & Chemical Corp., Terre Haute, Ind. (50-t-4)

Comstock, G. F., Met., Titanium Alloy Mfg. Co., Niagara Falls, N. Y. (50-t-2-c)

Cone, E. F., Editor, Metals & Alloys, 330 W. 42nd St., New York City (30-k, 30-p)

Conner, W. G., Jr., Supt. of Foundries, Greensburg Works, Walworth Co., Greensburg, Pa. (4-b)

Corbett, W. J., Vice Pres., Atlas Steel Casting Co., 1963 Elmwood Ave., Buffalo, N. Y. (2)

Creusere, Gordon, Met., Semet-Solvay Co., 2532 Buhl Bldg., Detroit, Mich. (50-t-4)

Crosby, V. A., Met. Engr., Climax Molybdenum Co., 14410 Woodrow Wilson, Detroit, Mich. (50-a, 50-t-2-c)

Culling, C. R., Vice Pres., Carondelet Foundry Co., 2101 S. Kingshighway, St. Louis, Mo. (49)

Curran, J. J., Res. Met., Walworth Co., Greensburg, Pa. (51e)

Curry, D. M., Tech. Service Staff, H. Kramer & Co. (Address: 14400 Glastonbury Rd., Detroit, Mich.) (53-c, 53-c-3)

Daasch, H. L., Prof. and Head, Mech. Engrg. Dept., University of Vermont, Burlington, Vt. (6-a-1)

Davis, A. C., Prof., Dept. of Experimental Engrg., Cornell University, Ithaca, N. Y. (6-a, 6-b-7, 6-c-2)

Davis, M. P., Chief Chemist & Met., Otis Elevator Co., 44 Wells Ave., Yonkers, N. Y. (6-c-1)

Deane, H. A., Asst. Works Mgr., Brake Shoe & Castings Div., American Brake Shoe & Foundry Co., Mahwah, N. J. (6-a-1, 50-n)

Deas, R. R., Jr., Asst. to Vice Pres., American Cast Iron Pipe Co., Birmingham, Ala. (50-f, 50-s)

DeBruyne, P. C., Supt., Moline Malleable Iron Co., St. Charles, Ill. (52-a, 52-h)

Delport, Vincent, Caxton House, Westminster, London, S. W. 1, England (Penton Publishing Co., 7, Kenton Gardens, Kenton, near Harrow, Middlesex, England) (1, 1-a)

Demmler, A. W., Met., Engr., Vanadium Corp. of America, P. O. Box 566, Bridgeville, Pa. (50-t-3)

Diefenbacher, V. L., Cost Supv., Hamilton Foundry & Machine Co., Hamilton, O. (2)

Dierker, A. H., Res. Engr., Engineering Experiment Station, Ohio State University, Columbus, O. (4-e, 50-t-2-a, 50-t-3)

Dietert, H. W., Pres., Harry W. Dietert Co., 9330 Roselawn Ave., Detroit, Mich. (6-a, 6-b-2, 6-b-3, 6-b-4, 6-b-5, 6-b-7, 6-b-8, 6-b-9, 6-c-1, 6-c-2)

Dobson, D. I., Met., General Malleable Corp., Waukesha, Wis. (52-g)

Donaldson, R. A., Met., Woodward Iron Co., Woodward, Ala. (50-t-2-a)

Donnocker, H. E., Field Engr., Ottawa Silica Co., Ottawa, Ill. (6-a-1)

Donoho, C. K., Met., American Cast Iron Pipe Co., Birmingham, Ala. (50-d)

Dost, F. J., Supt., Sterling Foundry Co., Wellington, O. (50-n)

Doty, M. F., Mgr., Casting Div., Clark Equipment Co., Buchanan, Mich. (Nominating Committee)

Dunbeck, N. J., Vice Pres., Eastern Clay Products Co., Eifort, O. (6-a, 6-b-1, 6-b-3)

Dunn, L. A., Supt. of Foundries, General Electric Co., Erie, Pa. (52-g)

Dwyer, Pat, Engrg. Editor, The Foundry, Penton Bldg., Cleveland, O. (50-a, 50-n, 50-r)

Eagen, T. E., Met., Cooper-Bessemer Corp., Grove City, Pa. (50-n)

Eggleston, G. K., Met., Detroit Lubricator Co., 5900 Trumbull Ave., Detroit, Mich. (6-a, 6-b-4, 53-a, 53-c, 53-c-1)

Erler, John, Met., Farrel-Birmingham Co., Ansonia, Conn. (50-a, 51-o)

Evans, G. S., Met., Mathieson Alkali Works, 60 E. 42nd St., New York City (50-t, 50-t-3)

Everett, L. E., Fdry. Supt., Key Co., E. St. Louis, Ill. (51-a, 51-o)

Everhart, J. O., Asst. to Gen. Supt., Kentucky Fire Brick Co., Haldeman, Ky. (50-t-6)

Farrel, Franklin III, Fdry. Mgr., Farrel-Birmingham Co., Ansonia, Conn. (3, 3-b)

Finster, W., Met., Reading Steel Casting Div., American Chain & Cable Co., Inc., Reading, Pa. (6-a, 6-b-7, 51-d)

Forbes, A. D., Asst. Supt., Gunite Foundries Corp., Rockford, Ill. (52-g)

Forbes, D. P., Pres., Gunite Foundries Corp., Rockford, Ill. (4, 6-a-1, 49, 52, 52-a)

Frank, R. H., Chief Met., The Bonney-Floyd Co., Columbus, O. (51-e)

Freund, C. J., Dean, College of Engrg., University of Detroit, Detroit, Mich. (3, 3-b)

Fuerst, P. Chas., Inspector, Falk Corp., Milwaukee, Wis. (6-b-1)

Fulton, A. M., Supt., Northern Malleable Iron Co., 867 Forest St., St. Paul, Minn. (52-a, 52-g, 52-h)

Gardner, H. B., Res. Assoc., Non-Ferrous Ingot Metal Institute, Bureau of Standards, Washington, D. C. (53-a, 53-e)

George, W. B., Met. & Fdry. Engr., R. Lavin & Sons, 3426 S. Kedzie Ave., Chicago, Ill. (53-c)

George, W. E., Asst. to Management, Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich. (4-b)

Gezelius, R. A., Met. Engr., General Steel Castings Corp., Eddystone, Pa. (6-b-3, 6-b-7, 51-a, 51-d)

Gould, M. H., Aluminum Co. of America, 2210 Harvard Ave., Cleveland, O. (6-b-9)

Glass, R. K., Met., Republic Steel Corp., S. Park Ave., Buffalo, N. Y. (Nominating Committee, 1-b)

Goldie, J. G., Fdry. Instructor, Cleveland Trade School, 535 Eagle Ave., Cleveland, O. (3, 3-a, 3-d)

Goss, J. E., Apprentice Supv., Brown & Sharpe Mfg. Co., Providence, R. I. (3, 3-b)

Greenidge, C. T., Battelle Memorial Institute, 505 King Ave., Columbus, O. (51-d)

Gregg, A. W., Fdry. Engr., Fdry. Equipment Div., Whiting Corp., Harvey, Ill. (4, 50-t-1, 51-a)

Grennan, John, Instr., Fdry. Practice, Dept. of Metal Processing, University of Michigan, Ann Arbor, Mich. (3, 3-d, 6-c-2, 50-o, 50-r, 50-s, 50-t-5)

Griggs, H. C., Met., Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn. (50-a)

Grim, R. E., Petrographer, Illinois State Geological Survey, 305 Ceramics Bldg., Urbana, Ill. (6-b)

Grotts, Fred, Pres., Ft. Pitt Steel Casting Co., McKeesport, Pa. (51-a)

Guion, C. P., Fdry. Equipment Engr., 3843 N. Central Park Ave., Chicago, Ill. (10)

Hall, John Howe, 228 W. Willow Grove Ave., Chestnut Hill, Philadelphia, Pa. (4-g, 49, 51, 51-a, 51-m)

Halliwell, G. P., Dir. of Res., H. Kramer & Co., 1347 W. 21st St., Chicago, Ill. (50-d, 53-h)

Hambley, W. A., Fdry. Met., Allis-Chalmers Mfg., (Address: 1170 N. 43rd St., Milwaukee, Wis.) (1-b, 50-t-1, 50-t-5)

Hamblin, K. H., Supt., The Palmyra Foundry Co., Palmyra, N. J. (52-b, 52-g)

Hamilton, W. C., Res. Dir., American Steel Foundries, East Chicago, Ind. (6-b-7, 51-e)

Hammond, T. S., Pres., Whiting Corp., Harvey, Ill. (Board of Awards)

Hanley, H. B., Fdry. Mgr., American Laundry Machinery Co., 50 Sherer St., Rochester, N. Y. (6-a-1)

Hansen, S. B., Ind. Engrg. & Const. Dept., International Harvester Co., 180 N. Michigan Ave., Chicago, Ill. (30-f)

Harrington, R. F., Fdry. Supt. & Chief Met., Hunt-Spiller Mfg. Co., 383 Dorchester Ave., Boston, Mass. (50-a)

Hartmann, W. C., Met. Supv., Bethlehem Steel Co., Bethlehem, Pa. (51-o)

Healey, M. V., Casting Met., General Electric Co., 1 River Rd., Schenectady, N. Y. (53-b)

Hels, G. E., Prod. Mgr., Vilter Mfg. Co. (Address: 2452 S. Kinnickinnic Ave.), Milwaukee, Wis. (2)

Henning, C. N., Supt., Patt. Dept., J. I. Case Co., Racine, Wis. (54-a)

Hess, E. F., Met. Engr., Ohio Injector Co., Wadsworth, O. (53-a, 53-c, 53-c-2)

Hewitt, L. C., Laclede-Christy Clay Prod. Co., 1711 Ambassador Bldg., St. Louis, Mo. (50-t, 50-t-6)

Hindle, N. F., Asst. Secretary, American Foundrymen's Association, 222 W. Adams St., Chicago, Ill. (6, 6-a, 53-a)

Hine, R. F., Fdry. Met., Studebaker Corp., South Bend, Ind. (50-o)

Hintze, F. W., Salesman, Illinois Clay Products Co., 608 S. Dearborn St., Chicago, Ill. (1-b)

Hoehn, C. J. P., Pres., Enterprise Foundry Co., 2902 Nineteenth St., San Francisco, Calif. (30-b)

Holtby, Fulton, Asst. Prof., University of Minnesota, 100 Mechanical Engineering Bldg., Minneapolis, Minn. (50-t-5)

Hopkins, D. P., Vice Pres., U. S. Pipe & Foundry Co., Burlington, N. J. (22-d, 24-c, 30-a, 50-b, 50-i)

Houze, J. O., Mgr., National Mall. & Steel Castings Co., 1400 S. 52nd Ave., Cicero, Ill. (10-b)

Hunter, F. W., Fdry. Supt., Sargent & Co. (Address: 40 Elm, East Haven, Conn.) (3)

Hydar, V. J., Personnel Div., Lockhead Aircraft Corp., Burbank, Calif. (3)

Hynan, E. T., Patt. Supt., Saginaw Mall. Iron Div., General Motors Corp., Saginaw, Mich. (54-a)

Jameson, A. H., Mgr. of Casting Sales, Malleable Iron Fittings Co., Branford, Conn. (51-p)

Jennings, E. G., Met., Canadian Bronze Co., Ltd., 999 Delorimer Ave., Montreal, Que., Canada (53-c, 53-c-4)

Jennings, W. R., Fdry. Supt., John Deere Tractor Co., Waterloo, Iowa (4-d, 50-tl)

Job, Robert, Vice Pres., Milton Hersey Co., Ltd., 980 St. Antoine St., Montreal, Que., Canada (50-a)

Johnson, H. W., Supt., Blast Furnace Dept., Inland Steel Co., East Chicago, Ind. (50-t-2-a)

Johnson, J. Morgan, Vocational Supv., Tri-City Manufacturers' Assn., Moline, Ill. (3, 3-a, 3-d)

Johnson, W. V., Pattern Supt., Oliver Farm Equipment Co., South Bend, Ind. (54-a)

Johnston, T. G., Met. Engr., Pig Iron Div., Republic Steel Corp., Republic Bldg., Cleveland, O. (50-t, 50-t-2-a)

Jones, E. O., Dir., Safety and Hygiene, American Foundrymen's Association, 222 W. Adams St., Chicago, Ill. (10, 10-b)

Joseph, C. F., Met., Saginaw Malleable Iron Div., General Motors Corp., Saginaw, Mich. (50-d, 50-t-5, 52-a, 52-g)

Joseph, T. L., Head, Dept. of Metallurgy, University of Minnesota, Minneapolis, Minn. (50-t-2-a)

Judson, H. H., Fdry. Supt., Goulds Pumps, Inc., Seneca Falls, N. Y. (50-s, 50-t-3)

Juram, W. C., Field Engr., Bristol Co., Waterbury, Conn. (50-tl)

Kanter, J. J., Res. Met., Crane Co., 4100 S. Kedzie Ave., Chicago, Ill. (50-t-5)

Kayser, J. A., Laclede-Christy Clay Prod. Co., 1711 Ambassador Bldg., St. Louis, Mo. (22-b, 50-t, 50-t-6)

Kelin, J. W., Asst. Sales Mgr., Federated Metals Div., American Smelting & Refining Co., 4041 Park Ave., St. Louis, Mo. (53-a, 53-b)

Kelly, J. M., Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa. (53-e)

Kemp, J. E., Supv. of Training, Walworth Co., Kewanee, Ill. (3)

Kempf, L. W., Met., Aluminum Res. Labs., Aluminum Co. of America, 2210 Harvard Ave., Cleveland, O. (53-b)

Kennedy, R. E., Secretary, American Foundrymen's Association, 222 W. Adams St., Chicago, Ill. (22-b)

Kindt, E. T., Pres., Kindt-Collins Co., 12697 Elmwood Ave., Cleveland, O. (54-a)

Kitto, Stanley, Treasurer, Belle City Malleable Iron Co., Racine, Wis. (2)

Knight, L. B., Jr., Vice Pres. in Charge of Sales, National Engineering Co., 549 W. Washington Blvd., Chicago, Ill. (6-a-1)

Kuniansky, Max, General Mgr., Lynchburg Foundry Co., Lynchburg, Va. (50-a, 50-d, 50-t, 50-t-2-b)

Kyle, P. E., Asst. Prof., Mech. Engrg., Massachusetts Institute of Technology, Cambridge, Mass. (6-b-5, 50-s)

Laird, Wm. J., Met., Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa. (49, 53, 53-a)

Lanahan, Frank J., Pres., Ft. Pitt Malleable Iron Co., P. O. Box 505, Pittsburgh, Pa. (Board of Awards)

Lancashire, Ernest, Chief Chem., Detroit Steel Casting Co., 4069 Michigan St., Detroit, Mich. (51-c)

Landgraf, G. F., Chief Met., Lebanon Steel Foundry, Lebanon, Pa. (51-e)

Lane, Paul S., Res. Mgr., Muskegon Piston Ring Co., Muskegon, Mich. (50-n)

Lansing, J. H., Shop Practice Engr., Malleable Founders' Society, Union Commerce Bldg., Cleveland, O. (49-a, 52-a, 52-c, 52-g, 52-h)

Larsson, Carl F., American Air Filter Co., Inc., 20 N. Wacker Dr., Chicago, Ill. (10)

Lawson, C. C., Supt., Wagner Malleable Iron Co., 1275 E. Sangamon St., Decatur, Ill. (52-g)

Lee, R. L., Secretary-Treasurer, The Liberty Foundry, Inc., Wauwatosa, Wis. (2)

Lefler, M. J., Works Mgr., Western Foundry Co., 3634 S. Kedzie Ave., Chicago, Ill. (50-t-2-a, 50-t-3, 50-t-5)

Leisk, J. A., Gen. Supt., Patt. Shops & Foundries, Allis-Chalmers Mfg. Co., Milwaukee, Wis. (54-a)

Leroux, G. J., Asst. Mgr., National Malleable & Steel Castings Co., 10600 Quincy Ave., Cleveland, Ohio (4-b)

Lesser, Nathan, Deere & Co., Moline, Ill. (10)

Leun, A. V., Refractories Engr., Bethlehem Steel Co., Bethlehem, Pa. (4-e)

Levi, W., Met., Lynchburg Foundry Co., Radford, Va. (50-t-5)

Lillieqvist, G. A., Asst. Research Dir., American Steel Foundries, East Chicago, Ind. (51-o, 51-p)

Lindgren, R. A., Supt., Blast Furnaces, Wisconsin Steel Works, South Chicago, Ill. (50-t-2-a)

Liskow, J. G., Chief Engr., C. B. Schneible Co., 3951 Lawrence Ave., Chicago, Ill. (10)

Lorig, C. H., Met., Battelle Memorial Institute, 505 King Ave., Columbus, O. (50-a, 50-t-3, 51-a)

Lowe, John L., Battelle Memorial Institute, 505 King Ave., Columbus, O. (1-b, 4-e, 50-tl, 50-t-5)

Lynch, A. D., Personnel Director, Young Radiator Co., Racine, Wis. (4-b)

Maack, H. W., Chief Chem. & Met., Crane Co., 4100 S. Kedzie Ave., Chicago, Ill. (52-a)

MacKenzie, J. T., Met., American Cast Iron Pipe Co., Birmingham, Ala. (22-a, 24-j, 24-o, 50-a, 50-b, 50-k, 50-l, 50-m, 50-s, 50-t, 50-t-l, 50-t-3, 50-t-4, 50-t-5, 50-t-6)

Mahin, W. E., Met. Engr., Feeder Engrg. Dept., Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa. (50-a, 50-g)

Mason, Howard, Personnel Mgr., Symington-Gould Corp., Depew, N. Y. (6-b-7)

Massari, S. C., Res. Met., Association of Manufacturers of Chilled Car Wheels, 445 N. Sacramento Blvd., Chicago, Ill. (50-s, 50-t, 50-t-4)

Mathiesen, C., Prod. Mgr., Whitehead Bros. Co., P. O. Box 864, Albany, N Y. (6-a, 6-b-4)

May, P. J., Service Engr., Cleveland Quarries Co., 1125 Builders Exchange, Cleveland, O. (50-t-6)

McCandlish, R. W., Research Corp., 59 E. Van Buren St., Chicago, Ill. (10)

McClaren, Lewis, D., Mgr., By-Prod. Coke Dept., Republic Coal & Coke Co., 8 S. Michigan Ave., Chicago, Ill. (50-t)

McDougall, A. H., Vice Pres., Whiting Corp., Harvey, Ill. (30-g)

McElwee, R. G., Mgr., Foundry Alloy Div., Vanadium Corp. of America, 2440 Book Bldg., Detroit, Mich. (50-a, 50-n, 50-t, 50-t-2, 50-t-2-c)

McFarlin, H. F., Iron and Steel Fdry. Foreman, Lunkenheimer Co., Cincinnati, O. (Nominating Committee)

McFerrin, W. B., Fdry. Met., Cadillac Motor Car Co., 2860 Clark Ave., Detroit, Mich. (1-b, 6-b-1)

McKinney, P. E., Met. Engr., Bethlehem Steel Co., Bethlehem, Pa (50-a, 51-a, 51-e, 51-n)

McMahon, W. O., Chief Fdry. Met., Sloss-Sheffield Steel & Iron Co., Birmingham, Ala. (50-t, 50-t-2-a)

McMillan, W. D., Met., International Harvester Co., Blue Island & Western Aves., Chicago, Ill. (52-g)

McMullan, S., Western Electric Co., Cicero, Ill. (10, 10-a, 10-b)

McNulty, J. E., Foreman, McKinnon Industries, St. Catherines, Ont., Canada (53-b)

Melmoth, F. A., Vice Pres., Detroit Steel Casting Co., 4069 Michigan St., Detroit, Mich. (Nominating Committee, 6-a-1, 49-a, 51-a, 51-c)

Meloche, D., Institute of Thermal Research, 675 Bronx River Rd., Yonkers, N. Y. (50-t-2-b)

Merrefield, G. W., Salesman, Continental Roll & Steel Foundry Co., East Chicago, Ind. (3)

Metzger, E. J., Supt., Falcon Bronze Co., 218 S. Phelps St., Youngstown, O. (2, 4-c, 53-h)

Miller, B. A., Chief Met., Cramp Brass & Iron Foundries Co., Paschall Station, Philadelphia, Pa. (50-tl, 53-d)

Minert, G. K., Asst. Met., Gunite Foundries Corp., Rockford, Ill. (4-e)

Minich, V. E., Pres., American Foundry Equipment Co., 52 Vanderbilt Ave., New York City (1)

Mooney, R. H., Chief Plant Engr., Saginaw Malleable Iron Div., General Motors Corp., Saginaw, Mich. (6-a-1)

Moore, R. E., Vice Pres. & Treas., Flockhart Foundry Co., 83 Polk St., Newark, N. J. (30-b)

Moore, R. S., Harbison-Walker Refractories Co, Farmers Bank Bldg, Pittsburgh, Pa. (50-t-6)

Morey, R. E., Sand Research, Naval Research Laboratory, Washington, D. C. (6-b-1, 6-b-9)

Mount, O. E., Treasurer, American Steel Foundries, 410 N. Michigan Ave., Chicago, Ill. (30-j)

Mulcahy, B. P., Res. Engr., Citizens Gas & Coke Utility, Indianapolis, Ind. (50-t, 50-t-4)

Munson, R. S., Vice Pres., Atlantic Steel Casting Co., 6th & Lloyd Sts., Chester, Pa. (51-a, 51-p)

Nass, C. V., Asst. Supt. of Fdries., Fairbanks Morse & Co., Beloit, Wis. (Nominating Committee, 6-a, 53-a, 53-d)

Nichols, A. S., Vice Pres., Illinois Clay Products Co., 608 S. Dearborn St., Chicago, Ill. (1-b)

O'Brien, B. C., Vice Pres., Roots-Connersville Blower Co., Connersville, Ind. (50-t, 50-tl)

O'Connor, D. Frank, Divisional Supt., Walworth Co., S. Boston, Mass. (4-f, 53-c)

Ogden, R. L., Supt. of Fdries., Stockham Pipe Fittings Co., Birmingham, Ala. (52-b)

Overstreet, F. L., Fdry. Engr., Illinois Clay Products Co., 1178 22nd St., Moline, Ill. (1-b, 6-b-1)

Page, E. W., Manager, General Electric X-Ray Corp., 2012 W. Jackson Blvd., Chicago, Ill. (51-e)

Parker, D. L., Steel Fdry. Supt., General Electric Co., 69 Norman St., Everett, Mass. (6-a, 6-b-7, 6-f-2, 51-a, 51-h)

Parsons, R. W., Met., Ohio Brass Co., Mansfield, O. (53-a, 53-b)

Patch, N. K. B., Secretary, Lumen Bearing Co., 197 Lathrop St., Buffalo, N Y. (30-h)

Peregoy, L. S., Pres., Sivyer Steel Casting Co., Milwaukee, Wis. (10-b)

Phillips, G. P., Chief Mt., Automotive Foundry Div., International Harvester Co., 2600 W. 31st, Chicago, Ill. (4, 50-a, 50-g, 50-n, 50-t, 50-t-5)

Phillips, H. D., Plant Mgr., Lebanon Steel Foundry, Lebanon, Pa. (51-a, 51-c)

Phillips, W. J., Sales Engr., Symington-Gould Corp., Symington Place, Rochester, N. Y. (51-c)

Pohlman, M. W., Vice Pres., Pohlman Foundry Co., 205 Baitz Ave., Buffalo, N. Y. (Nominating Committee)

Post, Marshall, Vice Pres. & Works Mgr., Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa. (Board of Awards, Nominating Committee, 1)

Prendergast, James, Mgr., Fdry. Div., Sullivan Machinery Co., Claremont, N. H. (30-e)

Priestley, K. H., Met., Eaton-Erb Foundry Div., Eaton Mfg. Co., Vassar, Mich. (50-a, 50-o)

Pryse, L. W., Salesman, Hickman Williams & Co., First National Bank Bldg., Cincinnati, O. (50-t-2-b)

Pyle, A., Jr., Secretary-Treas., Pyle Pattern & Mfg. Co., 1201 Sanford, Muskegon, Mich. (54-a)

Randall, C. P., Asst. Chem., Hunt-Spiller Mfg. Co., 383 Dorchester Ave., Boston, Mass. (6-a, 6-b-2, 6-b-7, 6-c-1, 6-c-3)

Rayner, Harry, Fdry. Met., Dodge Bros. Corp., 7900 Jos. Campau, Detroit, Mich. (50-n)

Reed, C. S., Jr., Secretary, Chicago Retort & Fire Brick Co., 208 S. La Salle St., Chicago, Ill. (50-t, 50-t-6)

Reed, H. B., Met., Westinghouse Air Brake Co., Wilmerding, Pa. (53-e)

Reeder, D. B., Met., Electro Metallurgical Co., 230 N. Michigan Ave., Chicago, Ill. (50-t)

Reichert, W. G., Fdry. Met., American Brake Shoe & Foundry Co., Mahwah, N. J. (1-b, 6-a, 6-b-4, 6-b-5, 6-b-7, 6-b-8, 6-c-1, 6-c-3, 50-t-2-a, 50-t-2-b)

Reid, Vaughan, Pres., City Pattern Works, 1161 Harper, Detroit, Mich. (49, 54, 54-a)

Reynolds, J. E., Met., U. S. Pipe & Foundry Co., Bessemer, Ala. (50-t-2-a)

Rich, H. M., Hickman Williams & Co., Ford Bldg., Detroit, Mich. (50-t-2-a)

Ries, H., Tech. Dir., Fdry. Sand Research Committee, 401 Thurston Ave., Ithaca, N. Y. (6, 6-a, 6-c-1, 6-c-3, 6-f-1, 6-f-4, 30-n)

Rishel, H. M., Works Mgr., American Steel Foundries, Granite City, Ill. (51-a)

Roast, Harold J., Vice Pres., Canadian Bronze Co. Ltd., 999 Delorimier Ave., Montreal, Que., Canada (53-a)

Roberts, C. S., Vice Pres., Dodge Steel Co., 6501 Tacony St., Philadelphia, Pa. (2)

Robson, H. C., Works Mgr., Joy Mfg. Co., Franklin, Pa. (4-c)

Roeming, E H., Gray Iron Fdry. Accountant, Gray Iron Castings Div., Chain Belt Co., 1600 W. Bruce St., Milwaukee, Wis. (2)

Romanoff, Wm., Tech. Supt., H. Kramer & Co., 2119 S. Loomis St., Chicago, Ill. (4-g, 49-a, 53-g, 53-h)

Root, A. B., Jr., Asst. Gen. Mgr., Hunt-Spiller Mfg. Co., 383 Dorchester Ave., Boston, Mass. (10-b)

Rosenthal, P. C., Instr. of Met., Dept. of Mining & Met., University of Wisconsin, Madison, Wis. (50-g)

Rother, W. H., Met., Buffalo Foundry & Machine Co., 1543 Fillmore Ave., Buffalo, N. Y. (50-a)

Roueche, W. Lee, Works Mgr., McWane Cast Iron Pipe Co., Birmingham, Ala. (50-tl)

Rowe, H. J., Met. Engr., Aluminum Co. of America, 2210 Harvard Ave., Cleveland, O. (53-c)

Rudesill, L. H., Met., Griffin Wheel Co., 445 N. Sacramento Blvd., Chicago, Ill. (50-t-3)

Ruten, W. H., Asst. Prof. in Practical Mech, University of Nebraska, Lincoln, Nebr. (3)

Saeger, C. M., Jr., Met., U. S. Bureau of Standards, Washington, D. C. (6-a, 6-b-4, 6-b-5, 6-b-8, 6-f-3, 50-a, 50-d, 53-h)

St. John, H. M., Supt., Dept. No. 5, Crane Co., 4100 S. Kedzie Ave, Chicago, Ill. (4-g, 49-a, 53-g, 53-h)

Saunders, W. M., Fdry. Consultant, 184 Whittier Ave., Providence, R. I. (6-a-1)

Sawtelle, D. F., Met., Malleable Iron Fittings Co., Branford, Conn. (4-f, 6-b-5, 52-g)

Schilling, P. R., Asst. to Pres., Superior Steel & Mall. Castings Co., Benton Harbor, Mich. (52-g)

Schnee, V. H., Supervising Engr., Battelle Memorial Institute, 505 King Ave., Columbus, O. (50-t-2-c)

Schubert, C. E., Asst. Prof., Mech. Engrg., University of Illinois, Urbana, Ill. (6-b-3)

Schumacher, G. A., Met., Albion Malleable Iron Co., 505 Irwin Ave., Albion, Mich. (6-b-3, 52-g)

Schwartz, H. A., Mgr. of Res., National Malleable & Steel Castings Co., 10600 Quincy Ave., Cleveland, O. (1, 6-a-1, 24-f, 24-m, 52-a, 52-b, 52-e, 52-f)

Scott, F. W., University of Minnesota, Minneapolis, Minn. (50-t-3)

Sedlon, V. J., Pres., Master Pattern Co., 5969 E. 37th St., Cleveland, O. (54-a)

Sefing, F. G., Res. Met, International Nickel Co., 67 Wall St., New York City (50-a, 50-s)

Sherman, R. A., Supv., Fuels Div., Battelle Memorial Institute, 505 King Ave., Columbus, O. (50-t-4)

Sherwin, L. M., Div. Supt., Fdry. & Patt. Shop Div., Brown & Sharpe Mfg. Co., Providence, R. I. (30-q, 54-a)

Sims, C. E., Supervising Met., Battelle Memorial Institute, 505 King Ave., Columbus, O. (51-a, 51-c, 51-i)

Smith, E. B., Vice Pres., Brake Shoe & Castings Div., American Brake Shoe & Foundry Co., 230 Park Ave., New York City (30-b)

Smith, E. K., Met., Electro Metallurgical Co., 1210 Ford Bldg., Detroit, Mich. (49-a, 50-a, 50-q, 50-t, 50-t-2-b, 50-t-2-c, 52-a)

Smith, H. L., Chief Met., Federated Metals Div., American Smelting & Refining Co., 615 Gross St., Pittsburgh, Pa. (53-a, 53-e)

Smith, L. C., Engr., Spencer Turbine Co., Hartford, Conn. (50-tl)

Spencer, W. H., Mgr., Fdry. Div., Wilkening Mfg. Co., 2000 S. 71st, Philadelphia, Pa. (22-c, 24-b, 49, 50, 50-a, 50-d, 50-h)

Sprague, P. T., Pres., Hays Corp., Michigan City, Ind. (50-tl)

Steinebach, F. G., Editor, *The Foundry*, Penton Bldg., Cleveland, O. (1, 50-s)

Stettbacher, Wayne, Dir. of Apprentice Training, Employers' Association of Detroit, 2309 Book Tower, Detroit, Mich. (3)

Stone, Bert, Sand Chem., Belle City Malleable Iron Co., Racine, Wis. (6-a, 6-b-1)

Storie, D. M., Supt., Fittings, Ltd., Oshawa, Ont., Canada. (52-a)

Stuart, H. W., U. S. Pipe & Foundry Co., Burlington, N. J. (24-c, 50-b, 50-i, 50-t-2-b)

Sugar, A., Met., Monarch Aluminum Mfg Co., 9301 Detroit Ave., Cleveland, O. (24-n, 53-h)

Sullivan, J. D., Chief Chem., Battelle Memorial Institute, 505 King Ave., Columbus, O. (50-t-6)

Taylor, H. F., Met., Naval Research Laboratory, Anacostia Sta., Washington, D. C. (6-b-8)

Teetor, R. J., Pres., Cadillac Malleable Iron Co., Cadillac, Mich. (52-a)

Tegman, R., American Brake Shoe & Foundry Co., Mahwah, N. J. (6-b-2)

Thieme, C. O., Works Mgr. & Chief Met., H. Kramer & Co., 1359 W. 21st St., Chicago, Ill. (53-d)

Thomas, L. B, Chief Met, Campbell Wyant & Cannon Foundry Co., Muskegon, Mich. (50-t-5)

Thomson, James, Chief Plant Engr., Continental Roll & Steel Foundry Co., E. Chicago, Ind. (4-d)

Tobin, John F., Sales Engr., American Blower Corp., 228 N. La Salle St., Chicago, Ill. (10)

Touceda, E., Consulting Engr., 943 Broadway, Albany, N. Y. (24-e, 52-d)

Tour, Sam, Vice Pres., Lucius Pitkin, Inc., 47 Fulton St., New York City (53h)

Troy, E. C., Met., Dodge Steel Co., 6501 Tacony, Philadelphia, Pa. (51-c)

Van Kooy, J. R., Instr. in Patternmaking, Milwaukee Vocational School, Milwaukee, Wis. (3)

Vanick, J. S., Met., International Nickel Co., 67 Wall St., New York City (50-a)

Vial, F. K., Vice Pres., Griffin Wheel Co., 445 N. Sacramento Blvd., Chicago, Ill. (24-d, 50-j)

Wade, C. W., Factory Training Supv., Caterpillar Tractor Co., Peoria, Ill. (3, 3-a)

Wagner, John A., Pres., Wagner Malleable Iron Co., Decatur, Ill. (2)

Walker, Stanton, Consulting Engr., National Industrial Sand Assn., Munsey Bldg., Washington, D. C. (6-a-1)

Walls, F. J., Met., International Nickel Co., 10-277 General Motors Bldg., Detroit, Mich. (4, 49, 50, 50-a, 50-f, 50-n, 50-t, 50-t-2-c, 50-t-5)

Wartgow, F. E., Time Motion Study Engr., American Steel Foundries, E. Chicago, Ind. (4-c)

Washburn, H. S., President, Plainville Casting Co., Plainville, Conn. (Board of Awards, Nominating Committee)

Wasson, S. C., Mgr., National Mall. & Steel Castings Co., Indianapolis, Ind. (Nominating Committee)

Watts, T. C., Falcon Bronze Co., 218 S. Phelps St., Youngstown, O. (53-a, 53-b)

Weaver, F. L., Met., Great Lakes Foundry Sand Co., United Artists Bldg., Detroit, Mich. (1-b, 6-al, 6-cl)

Weigand, S. A., The Lunkenheimer Co., Beekman & Waverly Aves., Cincinnati, O. (53-c)

West, T. D., Fdry. Supt., Symington-Gould Corp., Rochester, N. Y. (51-p)

Westover, Jeff. Alan, Supv. of Time Study, Clark Equipment Co., Buchanan, Mich. (4-c)

Wick, J. L., Jr., Pres., Falcon Bronze Co., 218 S. Phelps St., Youngstown, O. (Board of Awards, 6-a-1)

Wilke, R. E., Fdry. Met., John Deere Tractor Co., Waterloo, Iowa. (43, 6-b-5, 50-t-5)

Wilson, L. C., Gen. Mgr., Reading Steel Casting Div., American Chain & Cable Co., Reading, Pa. (6-al- 24-k, 51-a, 51-e, 51-g, 51-l)

Wine, W. C., Supt., Sibley Foundry & Machine Co. South Bend, Ind. (1-b)

Wise. L. J., Mgr., Res. & Development, Chicago Malleable Castings Co., 120th & S. Racine, Chicago, Ill. (52-a)

Wolf, F. L., Tech. Dir., Ohio Brass Co., Mansfield, O. (Nominating Committee, 6-a-l, 24-h, 52-g, 53-h)

Womochel, H., Res. Asst., Engineering Experiment Station, Michigan State College, East Lansing, Mich. (6-b-9)

Wood, S. V., Pres., Minneapolis Electric Steel Castings Co., 3800 N. E. 5th St., Minneapolis, Minn. (51-a)

Wood, T. J., Asst. Met., American Brake Shoe & Foundry Co., Mahwah, N. J. (50-t-4)

Woodliff, E. E., Harry W. Dietert Co., 9330 Roselawn Ave., Detroit, Mich. (4-f, 6-b-2)

Woodward, R. C., Chief Met., Bucyrus-Erie Co., S. Milwaukee, Wis. (51-c)

Woody, J. A., Asst. Works Mgr., American Cast Iron Pipe Co., Birmingham, Ala. (50-o)

Wornom, A. H., Fdry. Training Instr., Newport News Ship Building & Dry Dock Co., Newport News, Va. (3)

Wright, A. S., Met., Hunt-Spiller Mfg. Corp., 383 Dorchester Ave., Boston, Mass. (50-o)

Yost, Donald Lee, Fdry. Met., Budd Wheel Co. (Address: 12051 Wade St.), Detroit, Mich. (4-f)

Young, E. R., Met. Engr., Climax Molybdenum Co., 230 N. Michigan Ave., Chicago, Ill. (50-a, 51-d)

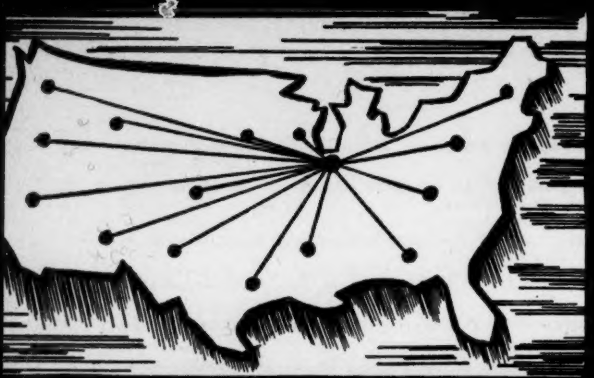
Zahn, Charles, Fdry. Supt., Vilter Mfg. Co., 2217 S. 1st, Milwaukee, Wis. (1-b)

Ziebell, A. C., Pres., Universal Foundry Co., Oshkosh, Wis. (4-b)

Ziegler, N. A., Res. Met., Crane Co., 4100 S. Kedzie Ave., Chicago, Ill (53-b)

Zirzow, E. C., Chief Chem., National Mall. & Steel Castings Co., 10590 Quincy Ave., Cleveland, O. (6-a, 6-b-4)

Zuege, D. C., Tech. Dir., Sivyer Steel Casting Co., Milwaukee, Wis. (4, 6-b-7, 51-a, 51-d, 51-o)



Chapter Activitie

Annual Outing Staged by Southern California

By W. F. Haggman*, Los Angeles, Calif.

THE third annual stag picnic of the Southern California chapter was held at the Lakewood country club with more than 275 members and guests attending. The afternoon was taken up with golf, baseball, horseshoe pitching, foot races and futile efforts, on the part of the foundrymen, to ride "Bonzo," Hollywood's trained mule. The appearance of the musicians, during the afternoon's entertainment, brought forth some "barber shop quartets" that the chapter knew nothing about.

During the dinner the athletic and door prizes were awarded, followed by a fine vaudeville show.

Glenn W. Merrefield has resigned as superintendent, Warman Steel Casting Co., Vernon, Calif., and is now associated with the Continental Roll and Steel Foundry Co., East Chicago, Ind. Mr. Merrefield was vice-president of the chapter and was most active in apprentice training work. He had recently been appointed to the National Board on Apprentice Training.

Another vacancy was left by Jack Eberhard who left for Cicero, Ill., to take the position of foundry superintendent, Electrocast Steel Foundry Co. Mr. Eberhard was formerly employed by Kay-Brunner Steel Products, Inc. Jack was a director of the chapter and served as chairman of the entertainment committee.

To succeed Jack Eberhard on the board of directors will be Robert Gregg, foundry superintendent, Reliance Regulator, Alhambra. Bob was a leader in organizing the Southern California chapter and served as its first chapter chairman. He has always taken a keen interest in all chapter activities, particularly in apprentice training.

*Secretary, Southern California Chapter and Manager, Foundry Specialties Co.

Wisconsin Chapter Enjoys Outing

By H. C. Waldron*, Milwaukee, Wis.

THE fifth annual golf tournament and dinner sponsored by the Wisconsin chapter was held July 19 at the Ozaukee country club. The record breaking crowd that assembled at the country club thoroughly enjoyed themselves either participating in the tournament or staying close to the club house and getting acquainted with fellow foundrymen.

Following the afternoon's activity, the members and guests settled down to a good dinner and an excellent floor show. There was music and entertainment galore, which was enjoyed immensely by those attending the dinner. Some excellent prizes were awarded to the golfers who toured the course in professional fashion. Numerous door prizes were presented to lucky number holders.

One of the features of the evening was the presentation of the President's Cup to past president Roy Jacobs by President Ben Claffey.

*Secretary, Wisconsin Chapter and Asst. Fdry. Supt., Nordberg Mfg. Co.

Detroit Chapter Holds Golf Party

By O. E. Goudy*, Detroit, Mich.

THE Detroit chapter held its July meeting at the Clinton Valley Golf and Country Club, Thursday, July 18th.

About 60 members and friends attended the afternoon golf party. Dinner in the evening was followed by a short business meeting and the distribution of golf prizes was made by the chairman of the golf committee, W. B. Crawford, Atlas Foundry Co.

*Kelsey-Hayes Wheel Co.

Golf predominated at the Wisconsin Chapter outing. Some of the "slicers and hookers" of various foursomes, as well as others attending, are shown below.
(Photos courtesy John Bing, A. P. Green, Fire Brick Co.)

Scenes of Cincinnati District Chapter annual meeting held in June. (Left) Herman Ewig, chapter chairman, discusses chapter progress with C. E. Hoyt, association Executive Vice-President.

St. Louis Reveals Fall Lecture Course Plans

ST. LOUIS district chapter has announced preliminary plans for a comprehensive educational program, tentatively scheduled, to begin with a Round Table Conference at their October 10th meeting. Thereafter, according to present plans, these lecture meetings will be held each Wednesday night for a period of 12 weeks.

The course, designed to be fundamentally educational and elementary, is planned to be developed under the following general outline of courses: (1) Gating and Risering, (six evenings); (2) Sands and Facings, (three evenings), and (3) Fundamentals of Shop Drawing, (three evenings).

It is proposed to have the sessions in a two-hour period, the entire group in attendance receiving a lecture for one hour, following which there would be a division into gray iron and steel sections, each with a prepared leader. A one-hour discussion of the subject of the evening would then be given, covering more specifically the separate phases of iron and steel.

Among the various sub-topics to be discussed under the general subject of gating and rising are: principles of feeding, liquid and solid shrinkage, changes in cooling, chemistry and physics of solidification.

Under sands and facings several of the topics scheduled for lecture and discussion are: kinds of sands used in the St. Louis area, properties of sands for various types of jobs and work, facings, methods of testing sands, etc.

It has been felt by chapter officers that such a course would be a definite contribution toward national defense. It would tend to further educate young men in our trade, who have a very definite place in our defense setup through their importance to the industry. This is particularly true because of the current shortage of properly trained men.

The course will be under the chairmanship of Carl Morken, Carondelet Foundry Co., together with Fred Riggan, The Key Co.; L. Desparois, Pickands, Mather & Co., and J. W. Kelin, Federated Metals Div., A. S. & R. The apprentice training committee, of which George Mitsch, American Car & Foundry Co., is chairman, is co-operating with the lecture course committee. Other members of the apprentice committee are: C. B. Shanley, Semi-Steel Casting Co.; William McKee, The Key Co.; Emil Goerger, City Pattern & Model Co.; Roy Jacobson, Carondelet Foundry Co.; Francis O'Hare, Central Brass & Aluminum Foundry Co., and T. Ross, David Rankin Jr. School of Mechanical Trades.

William Carter Bliss, St. Louis District Chapter

William Carter Bliss, works manager, Scullin Steel Co., St. Louis, Mo., was elected chairman of the St. Louis District chapter. Mr. Bliss was born in St. Louis, Mo.; received the greatest amount of his schooling there, and worked practically all his

(Photos courtesy W. B. Coleman, W. B. Coleman Co.)

Onlookers watch "huffers and puffers" during the ball game at Philadelphia Chapter outing.

(Photos courtesy W. B. Coleman, W. C. Coleman Co.)

Views of baseball players and spectators at Philadelphia outing. Top center shows how foundrymen's technique has improved since "a barefoot boy."

life in that city. He completed two years of study at Washington University, following his graduation from grammar school and Soldan high school, and then went on to Cornell University, Ithaca, N. Y., to finish a course in mechanical engineering, being graduated in 1917 with a degree of mechanical engineering. Mr. Bliss then attended training camp for second officers at Fort Sheridan, Ill., and was commissioned a second lieutenant in the ordnance department. At the close of the war he was promoted to the rank of captain. After the war he became engineer, mill department, Scullin Steel Co., and in 1922 was made assistant superintendent of foundry. Following vigorous and energetic work he became superintendent and then in 1934 was appointed works manager.

He is a member of A.F.A., A.S.M.E. and Steel Founders Society of America. Continuing with his army contacts he is connected with the Army Ordnance Association and is lieutenant-colonel in the Ordnance Reserve.

B. D. Claffey, Wisconsin Chapter

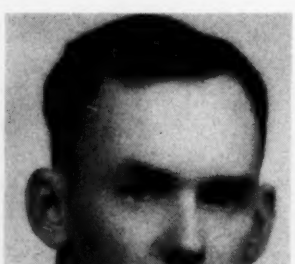
When attending meetings of the Wisconsin chapter this year a familiar voice will be heard calling the meetings to order. That voice will belong to B. D. Claffey, manager, gray iron and aluminum division, General Malleable Corp., Waukesha, Wis. Mr. Claffey has served as secretary and vice-president of the Wisconsin chapter. He was also chairman of the Wisconsin chapter committee which staged the 1940 or Third Annual Foundry Conference.

The newly elected chapter president started his foundry work as a laborer and later as core maker and molder with the Spring City Foundry, Waukesha, remaining with the company until 1928, when he became foundry adviser with the Wisconsin Motor Co., Milwaukee. Later he was affiliated with the Milwaukee Gray Iron Foundry Co., as works manager. He held this position until 1938, when he organized the Claffey Casting Co., of which he was president and general manager. In 1936, Claffey Casting Co. merged with the General Malleable Corp., Mr. Claffey being made manager, gray iron and aluminum division.

In addition to his membership in A.F.A., and being elected to the Board of Directors of the Association at the 44th annual convention, Mr. Claffey is a member of the Society of Automotive Engineers and the Gray Iron Founders' Society.

D. M. Storie, Ontario Chapter

D. M. Storie, general foundry superintendent, Fittings Ltd., was elected chairman of the Ontario chapter for the 1940-41 year. Mr. Storie was born in Oshawa, Ont., Canada, January 27, 1906, and attended public schools and the Oshawa high school in Oshawa. Fittings Ltd. employed him in the drafting department in 1924. In 1925 he was a pattern maker, then two years later he was made a foundry clerk and a year later, 1928, found him in charge of foundry training. He was made gray iron foundry foreman in 1929 and was transferred, in 1932, to the malleable foundry as malleable foundry foreman. Since 1934 he has been employed as general foundry superintendent.



D. M. Storie

W. Carter Bliss

B. D. Claffey

NEW MEMBERS

Birmingham Chapter

Frederick W. Hanson, Birmingham, Ala., Met., Electro Metallurgical Co., New York, N. Y.

Charles Adrian Krebs, Analyist, National Cast Iron Pipe Co., Birmingham, Ala.

Chicago Chapter

Nicholas A. Todoroff, Sand Tester, Crane Company, Chicago, Ill.

Detroit Chapter

C. O. Bartlett, Detroit, Mich., Dir. and Mich. Repr., C. O. Bartlett & Snow Co., Cleveland, Ohio.

Frank Kress, Cadillac Motor Co., Detroit, Mich.

Metropolitan Chapter

Eclipse Aviation, Bendix, N. J. (Anthony Cristello, Fdry. Mgr.).*

Fred D. Hunter, Asst. to Works Mgr., American Brake Shoe & Foundry Co., New York, N. Y.

Martin Qualantone, Fdry. Trouble-Shooter, Wright Aeronautical Corp., Paterson, N. J.

W. S. Winslow, Met., R. Hoe & Company, Dunellen, N. J.

Michiana Chapter

W. V. Johnson, Supt. of Pattern Div., Oliver Farm Equipment Co., South Bend, Ind.

Victor H. Joyce, Tipton, Ind., Sales Repr., Swan Finch Oil Corp., Chicago, Ill.

Daniel Kovich, Melter, Clark Equipment Co., Buchanan, Mich.

Northeastern Ohio Chapter

W. J. Fruechtel, Sales Engr., The C. O. Bartlett & Snow Co., Cleveland, Ohio.

Milton L. Huemme, Salesman, Diamond Alkali Co., Cleveland, Ohio.

Henry C. Orr, Sales Engr., The C. O. Bartlett & Snow Co., Cleveland, Ohio.

Northern California Chapter

W. S. Gibbons, Asst. Foreman, Vulcan Foundry, Oakland, Calif.

R. W. Goldwater, Owner, Industrial Supply Co., Oakland, Calif.

Ontario Chapter

Gerald J. Gaukroger, Asst. Met., McKinnon Industries, Ltd., St. Catherines, Ont., Canada.

St. Louis Chapter

W. E. Illig, Fdry. Mgr., Banner Iron Works, St. Louis, Mo.

Southern California Chapter

Henry W. Howell, Partner, Howell Foundry Co., Whittier, Calif.

James Jordan, Gen'l Mgr., James Jordan Laboratory, Los Angeles, Calif.

Roy E. Paine, Metallurgist, Aluminum Co. of America, Los Angeles, Calif.

Wisconsin Chapter

Gilbert E. Hels, Production Mgr., The Vilter Mfg. Co., Milwaukee, Wis.

Bernard A. Wendorf, Chipping Room Foreman, The Vilter Mfg. Co., Milwaukee, Wis.

Outside of Chapter

Cia. Brasileira de Usinas Metallurgicas, Rio de Janeiro, Brazil.

Eric F. Burton, Met., Hoskins Foundry, Ltd., Perth, Western Australia.

P. R. Letz, Gen'l Supt., The Cooper-Bessemer Corp., Mt. Vernon, Ohio.

The Millom & Askam Hematite Iron Co., Ltd.—Millom, Cumberland, England.

H. Nakamura, Engineer, Mitsubishi Dockyard, Wadamisaki, Kobe, Japan.

John Vickers, Fdry. Mgr., Rolls-Royce, Ltd., Glasgow, S.W.2, Scotland.

E. Walcher, Vice-President, The Ohio Steel Foundry Co., Lima, Ohio.

Ross Williams, Pattern Maker, Arkansas Machine Specialty Co., Hope, Ark.

*Company Members.

Research Program Inaugurated at Battelle Institute

C. E. Williams, Director, Battelle Memorial Institute, Columbus, O., has announced that the recently organized Gray Iron Research Institute is to conduct a program of foundry research at Battelle Memorial Institute.

As a first part of the program it is planned to conduct studies of the fundamental principles of the melting of gray cast iron, using the combined laboratory facilities of the fuels and metallurgical laboratories, as well as the experimental foundry at Battelle. It is expected that these investigations will provide the groundwork for more accurate control of metal quality and composition. The technical information obtained in the operation of the experimental cupola will indicate to the member foundries the changes in practice, and the degree of control necessary to obtain the highest quality metals at the lowest operating costs.

The experimental program at Battelle will be under the direction of Dr. C. H. Lorig, supervising metallurgist, and R. A. Sherman, head, fuels division, Battelle Memorial Institute. John Lowe, newly appointed foundry engineer, Battelle staff, will serve as contact man between the laboratories and the member foundries, so that the results obtained in the research program can be translated into practical foundry operation without the loss of time. Mr. Lowe is well known to members of A.F.A. and the foundry industry as the author of technical papers dealing with production of gray cast iron. He has had a broad experience as a melter.

ABSTRACTS

NOTE: The following references to articles dealing with the many phases of the foundry industry, have been prepared by the staff of *American Foundryman*, from current technical and trade publications.
When copies of the complete articles are desired, photostat copies may be obtained from the Engineering Societies Library, 29 W. 39th Street, New York, N. Y.

Aluminum Bronze

CONTROL. *"Aluminum Bronze,"* by G. K. Dreher, *Canadian Metals and Metallurgical Industries*, vol. 3, no. 7, July, 1940, pp. 177-180, 182. Aluminum bronzes may be divided into three general divisions according to the stable structure which might be expected of a given composition, as alpha (A-1, A-2); alpha eutectoid (E-1, E-2); and delta eutectoid types (D-1, D-2). A general discussion of these aluminum bronzes is made showing the variations in these alloys, the results of close control and the field in which they are used most extensively. The mechanical properties are studied for the high-iron alloy type, alpha and alpha eutectoid alloys, straight aluminum bronze alloys and one per cent iron. Through the use of the centrifugal casting method means of extending the chill action to heavier sections is made possible. Several other desirable characteristics can be achieved by this method. In the study of heat treating it is shown that practically all aluminum bronze will respond to some form of heat treatment. The heat treatment of the three divisions of aluminum bronzes set forth in this article are then described in detail. In the last part of the paper the author tends to show what effect the working has on certain changes in the structure of aluminum bronze. Today, the author asserts, the aviation industry is the largest user of aluminum bronze. (Al.)

Bronzes and Brasses

SAND CAST. *"Sand Cast Bronzes and Red Brasses," The Metal Industry* (London), vol. 47, no. 2, July 12, 1940, pp. 22-26. This is the sixth of a series of recommended practices which are sponsored by the Non-Ferrous Division, American Foundrymen's Association. The practices given are tentative recommendations by specialists in their various fields, and are intended to be of practical use to foundrymen handling non-ferrous alloys. This report is limited to sand cast foundry bronzes, red brasses and semi-red brasses, and comprises general recommendations on molding, melting and pouring, finishing, heat-treatment and a full section dealing with the cause and prevention of a wide range of foundry defects. (Al.)

Cast Iron

BRAKE DRUMS. *"Metallurgical Aspects of Brake Drums for Heavy Duty Service,"* by V. A. Crosby and G. A. Timmons, *The Foundry*, vol. 68, no. 77, July, 1940, pp. 32-34, 83-84. The constant increase of bus, truck, railroad and airplane transportation has necessitated developing materials capable of satisfying rigorous requirements of brake drums for heavy duty service. During this period, while investigations have been carried on, five major facts have been obtained from development or experimental projects on brake drums: (1) cast iron apparently produces the best combination of relatively high coefficient of friction and resistance to wear and scoring, (2) most drums removed from heavy duty service fail by heat checking, (3) many are removed due to excessive wear, (4) some failures have been due to insufficient strength and (5) records have indicated drums made of cast iron with high carbon contents (3.50-3.80) are more resistant to heat checking than drums made of cast iron with lower carbon contents. After a study of conditions relating to those defects listed above the authors give reasons for gray cast iron offering the best possibility of satisfying the basic requirements for brake drum materials. It possesses a high coefficient of friction, good wear resistance and, because of its structual characteristics, it has the ability to resist scoring. The problem of greatest significance is the one relating to increasing the tensile strength and reducing cast iron's tendency to heat check. The authors go on to elaborate on this problem and give data on tests that they conducted on this problem. (C.I.)

COPPER. *"Electric Furnace Cast Iron Containing Copper,"* by T. E. Barlow, *Metals and Alloys*, vol. 12, no. 1, July, 1940, pp. 37-39. Copper alloy cast irons, despite their fast-growing application for such products as cylinder blocks, large gears, pumps, heavy duty brake drums, etc., as a group have not heretofore been subjected to any comprehensive examination of their mechanical properties in the various compositional combinations possible. Copper, when used in cast iron, has been employed because it is a mild graphitizer and chill reducer with good densening effect; this alloy addition also has shown to influence machinability and strength. Other benefits derived from this element have been found when used with carbide-formers like chromium, molybdenum and vanadium. The first part of this article turns all this qualitative information to fact, shows the effect of copper in cast irons of varying carbon, silicon and various other alloy contents. This gives foundrymen and engineers a chance to select compositions of copper cast irons that give the most desirable combinations of properties for specific types of service. (C.I.)

GLASS MOLDS. *"Glass Molds,"* by R. M. Scafe, *The Foundry*, vol. 68, no. 8, August, 1940, pp. 30-31, 103-105. This discussion is confined to a survey of the utility of the mold, what it does and what it must withstand in actual production; mold making requirements and a few of the economic problems which must be considered. Further, in relation to these requirements, to discuss the value and use of some of the alloys suitable for foundry operation, particularly in cupola melting. The worth or merit of any glass mold iron is measured by actual performance on the glass machine as measured in units of production per cleaning or re-dressing, total production life, and its effect upon the glass itself in luster and finish. (C.I.)

HEAT TREATMENT. *"Gray Cast Iron,"* by E. L. Bartholomew, *The Iron Age*, vol. 146, no. 5, August 1, 1940, pp. 52-54. Gray iron is one of the most widely used engineering metals. Outside of production technique and alloying practice, cast iron has come to be taken for granted, its uses governed by convention, its properties accepted, and many of its possibilities to a large extent overlooked. One possibility that has been experimented with is the problem of the wearing characteristics of gray cast iron. Various heat treatments have been devised which have increased the wearing properties of cast iron. The heat treating method described in this article is justified primarily by the marked improvement obtainable in physical and wear resistant properties of cast iron. (The method being under U. S. Patent No. 2200765.) Interest in the "austempering of steel" method led to the discovery that by a similar treatment of cast iron (that is, an interrupted quench) the same acicular structure or bainite was evidenced, but in the case of cast iron the austenite was not fully transformed after normal holding time in the hot quenching bath. The details of the heat treatment process are as follows: (1) heat to 1550° F., hold at heat 15 min.; (2) quench to 510° F., hold at heat 15 min.; and (3) air cool to room temperature. Tests made under the above conditions reveal many interesting facts. (C.I.)

Copper

POWDER METALLURGY. *"Powder Metallurgy of Copper,"* by C. G. Goetzel, *Metals and Alloys*, vol. 12, no. 1, July, 1940, pp. 30-35. Growing interest in the manufacture of metal products by powder metallurgy has emphasized the wealth of useful published data on the production factors involved. Engineers will therefore welcome the specific information related in this article concerning the effects of particle size, compacting pressure, heat treating temperature, time and atmosphere and other manufacturing variables on the shrinkage, density, porosity, hardness, tensile properties, fatigue strength, and other factors, of copper compacts. Copper itself is a widely used constituent of commercial powder metallurgy products, so that the data given here will have considerable direct utility. In addition many of them can be applied to powder practice in general, because of the fundamental tendencies revealed. A very important feature of the author's work is the information on, and evaluation of, hot compressing (simultaneous pressing and sintering). (Al.)

Corrosion

IHRIGIZING. *"Ihrigizing Makes Iron and Steel Corrosion Resistant,"* by B. J. Loos, *Industrial Gas*, vol. 19, no. 1, July, 1940, pp. 9, 16, 18. Ihrigizing is a process invented by Dr. H. K. Ihrig in which comparatively low-cost ferrous base materials are treated to produce a material which is highly resistant to corrosion, relatively high temperatures and mechanical or frictional wear. Surfaces of iron or steel articles are impregnated to any desirable depth, with a case of approximately 14 per cent silicon which becomes an integral part of the material itself. The production of these desirable properties in forged, rolled or cast low-carbon steel articles is now in use as a commercial process and notes on the process itself, together with informative data, are presented in this paper. (Co.)

Cupola

COKE. *"Utilize Coke from Cupola Drop,"* by Robert Leicht, *The Foundry*, vol. 68, no. 8, August, 1940, pp. 27, 105-106. After considerable comment and discussion by officials and employes on the advisability of

using coke from the cupola drop, a long list of objections and suggested answers to the objections were drawn up for consideration. Some of the objections were as follows: coke has lost its life; hard to ignite, full of ash; expensive to handle, etc. It so happened, in this particular case, that conditions forced this company to use the coke from under the cupola. The coke was used in this manner; new coke was used on the bed with the recovered coke between the charges in the proportion of 1 lb. coke to 6 lb. iron in the first four charges, 1 to 8 in the next four charges and 1 to 9 for the remainder of the heat. Interestin⌐ figures in the table of this article show total savings made by this method of using coke from the cupola drop. Method and equipment for spraying and cooling the coke in the cupola drop also is shown in this paper. (F.)

Non-Ferrous

CASTINGS. *"Strike Up the Band,"* by Pat Dwyer, *The Foundry*, vol. 68, no. 7, July, 1940, pp. 24-26, 85-87. The manufacture of band and orchestra instruments is a much larger job than one would expect. In the C. G. Conn, Ltd., plant in Elkhart, Ind., it is possible to obtain the conception that this industry comprises. Many of the small parts for various instruments are cast in a well appointed foundry where all operations are under close laboratory control. Most of the castings are so small that the greatest skill and ingenuity are required in laying the patterns out on a mold board in a manner to prevent miss runs. In the case of this company, normal yield of castings is 1 ton per month; while the average amount of metal melted in a month is 10 tons. The castings produced are made in sterling silver, aluminum, bronze and nickel. Two oil fired crucible type furnaces are used to melt the metal. A cleaning room is not necessary for such castings, as just a few sweeps of a broom are required after the castings come from the shakeout. The author gives details on the molding practice employed at this plant and a few comments on the cooperation between designer and foundry superintendent in making new patterns. (N.F.)

Steel Castings, Alloy

CHROMIUM. *"Three Per Cent Chromium Molybdenum Alloy Steel," Steel*, vol. 107, no. 6, August 5, 1940, pp. 68, 70. This steel, analyzing approximately 3.0 per cent chromium and 0.50 per cent molybdenum, is reported to be exceptionally versatile from the standpoint of properties and applications. It has been used for some time in castings in this country but is said to be well adapted to use in wrought form. Castings of the 3 per cent chromium composition, in either the as-cast condition or after a relatively simple heat treatment, have been used for several years in substantial tonnage for applications requiring good wear resistance coupled with considerable strength and toughness. The physical properties of these steels warrant their use in cases requiring special wear resistance. While no difficulty is experienced in making this steel, very definite procedures must be followed to obtain the high impact values. The steel for large forgings is regularly made in England in the acid open hearth. Smaller heats are made in the basic electric furnace. (S.)

HEAT AND CORROSION RESISTANT. *"Heat and Corrosion Resistant Castings,"* by D. W. Talbott, *Steel*, vol. 107, no. 4, July 22, 1940, pp. 40-44. In the alloy casting industry, stainless or heat and corrosion-resistant alloys are classified into two divisions; one covering the alloys for service temperatures below 1200° F. Listed in this article are twelve alloys, which due to their installation for numerous industrial uses are felt to be satisfactory. This article does not include all types proposed and occasionally used for some specific application. Description of a variety of chrome-nickel-iron alloys is given. The special requirements that these castings must adhere to, such as withstanding attacks of high temperatures and corrosive media, are related in conjunction with their application in different industries. (C.)

Steel Melting

INCLUSION CAUSES. *"Causes of Inclusions in Open Hearth Steel,"* by H. E. McGannon, *Industrial Heating*, vol. 7, no. 5, May, 1940, pp. 425-427. This is a review of the activities of the National Open Hearth Steel Conference, A.I.M.E., held in Pittsburgh, April 24-26. During this period five sessions were devoted to basic open hearth problems. Inclusions from refractories were of chief interest to the steel men when the sessions were started. Pouring pit refractory, regarded as the worst offender in causing fire-clay inclusions in killed steel, was one of the first problems discussed. General opinion being that this type of inclusion did not seldom originate at this source but might be caused by nozzle cutting-out or the sand used in sealing-off the well. An interesting method for determining the source of these inclusions is described. Those who argued that inclusions could be traced to pouring pit refractories pointed out that inclusions come from refractories, deoxidation products, entrained inclusions washed into the steel and fireclay inclusions from erosion of nozzles. Methods for determining these conclusions are listed also. Precautions are given to minimize inclusions through various design and construction methods. (S).

SLAG CONTROL. *"Slag Control,"* by C. H. Herty, Jr., *Metals Technology*, vol. 7, no. 4, June, 1940, pp. 1-18. This paper was presented as the Howe Memorial Lecture before the February A.I.M.E. meeting in New York. As shown in this paper, much is to be learned about slags and their effects on the metal, but further study, particularly on basicity, should open new fields of activity and new methods of approach to the steel-melting problem. Slag control has become an important part of open hearth activity from charge to tap, and the benefits received from it should warrant its extended use. Since requirements and raw materials play a big part in the way control must be exercised, set rules for operation cannot be made. Extensive study and research will make slag control's advantages better known and will make it an easy practice for the workmen to follow. (S.)

September Chapter Meeting Schedule

September 10

Cincinnati
Gateway Restaurant

Northern Illinois-Southern Wisconsin
Faust Hotel, Rockford
D. P. FORBES, Gunite Foundries Corp., Rockford
"Cost Plus Profit Equals Price"

September 12

Northeastern Ohio
Cleveland Club, Cleveland
New Officers' and Directors' Night
"Sinews of Steel," Bethlehem Steel Co.

St. Louis District
Hotel DeSoto
C. H. LORIG, Battelle Memorial Institute, Columbus, Ohio
"Research and Developments in Cast Metals"

September 13

Northern California
Alexander Hamilton Hotel, San Francisco
G. E. TROXELL, University of California, Berkeley
"Mechanical Methods of Testing Materials and Engineers' Use of Results Obtained"

September 14

Birmingham District
Pine View Beach
Outing

Michiana
LaPorte Country Club, LaPorte, Ind.
Outing

September 16

Quad City
Blackhawk Hotel, Davenport, Iowa
C. H. LORIG, Battelle Memorial Institute, Columbus, Ohio
"Research and Developments in Cast Metals"

Twin City Foundrymen's Association
L. H. RUDESILL, Griffin Wheel Co., Chicago
"Cupola Operation"

September 19

Detroit
Pine Lake Country Club
Outing

September 27

Ontario
H. L. SIMPSON, National Engineering Co., Chicago
"Merchandising Castings"

September 28

Chicago
Lincolnshire Country Club
Outing

Februray 20 and 21

Wisconsin Chapter
Fourth Annual Regional Conference
Hotel Schroeder, Milwaukee

Regrets After it is Too Late

Everyone has on more than one occasion wished that he could change some action, but the time was past and it was too late.

This has been the case with many members who, wishing to refer to some particular paper appearing in one of the bound volumes of A.F.A. Transactions, has found the volume out of print and the supply exhausted. Of the 47 volumes published by A.F.A. during its existence, only four remain in stock.

However it is Not Too Late

to start your library of Transactions with volumes

41 (1933 proceedings, 608 pages)
45 (1937 proceedings, 850 pages)
46 (1938 proceedings, 950 pages)
47 (1939 proceedings, 1030 pages)

These contain some of the best and most valuable papers on the more recent developments and researches of the foundry field, written by recognized authorities.

To members: Vol. 41—Price $2.00 per copy

Vols. 45, 46, 47—Price $3.00 per copy

ORDER NOW BEFORE IT IS TOO LATE

AMERICAN FOUNDRYMEN'S ASSOCIATION

222 West Adams Street, Chicago